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MONTHLY



'KATE' and 'VAL':
They crucified the
U.S. Fleet at Pearl Harbor

WAR MONTHLY

ISSUE 14

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August 1974. A World War II German 2,500lb bomb is found on a construction site in East London. Major Arthur Hogben, Royal Engineers Bomb Disposal Squad, holds explosives from the bomb while Sapper Karl Bradbury uses a sensitive stethoscope to listen for signs of clockwork detonator mechanism working. (See Bomb Disposal, page 34.)

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'VAL' AND 'KATE'

This successful twin-attack carrier team cut its teeth at Pearl Harbor. But lack of aircrews spelled the end

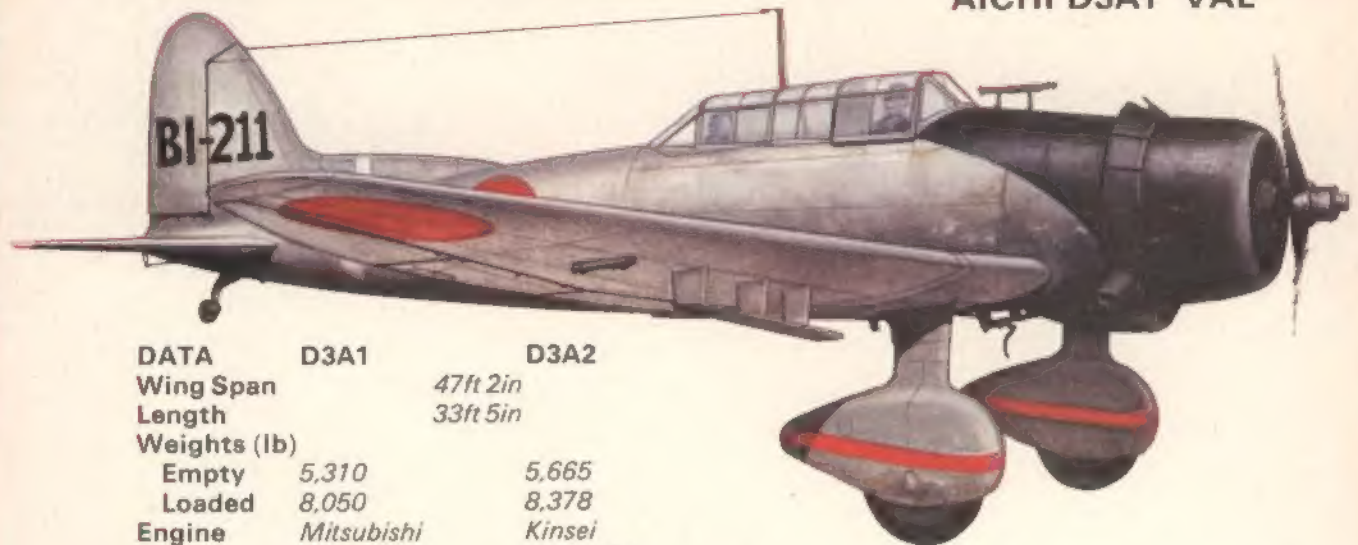
At 1120 on 8 May 1942 15 torpedo-bombers and 33 dive-bombers broke through the fighter patrols and the screens of cruisers and destroyers around the American aircraft carriers *Yorktown* and *Lexington*. The attack-aircraft from the Japanese carrier *Shokaku* managed to score only one hit on *Yorktown*, with a 554lb bomb. But the six torpedo-bombers and 15 dive-bombers from *Zuikaku* reached a higher degree of co-ordination in their attack on *Lexington*. Two groups of three torpedo-bombers attacked, one from either bow—approaching in loose formation at over 250mph. At a thousand yards from their target the first three dive-bombers released their loads—one 554lb SAP and two 132lb GP bombs apiece, from 2,500ft up, in 50° dives.

Lexington's AA batteries—5in guns, 1.1in quadruple and

20mm single automatic cannon—concentrated on the torpedo-bombers, which released their weapons at less than 800 yards range. The first bombs bracketed *Lexington* with near-misses. Other dive-bombers closed in on the carrier at short intervals—harassed by occasional and inaccurate AA fire from the screen. Just two of the bombs hit, both 132-pounders—inflicting minor damage—but shock and vibration due to the many near-misses caused extensive superficial damage. Although *Lexington* tried to 'comb' the tracks of the torpedoes, the port and starboard attack gave her little chance of dodging the 45-knot 'fish' and she took one hit each side. One bomber was shot down after releasing its torpedo.

This first fully co-ordinated attack on a carrier by dive-

AICHI D3A1 'VAL'



DATA	D3A1	D3A2		
Wing Span		47ft 2in		
Length		33ft 5in		
Weights (lb)				
Empty	5,310	5,665		
Loaded	8,050	8,378		
Engine	Mitsubishi Model 43	Kinsei Model 54		
Take-off hp	1,000	1,200	Fuel (galls)	160
Max			Range	237
Speed/	240mph	267mph	(max.)	915
Height	10,000ft	20,350ft	Statute	1,100
Ceiling	30,000ft	34,500ft	Miles	



The highly modified second prototype Aichi 11-Shi. A new power-plant, an 840hp Mitsubishi Kinsei 3, had supplanted the Hikari, but the production version had an improved Mitsubishi Kinsei 43, giving 1,000hp.

and torpedo-bombers had been carried out by the Type 99 Carrier Bomber and the Type 97 Carrier Attack Bomber, better known as the Aichi D3A1 (Val) and the Nakajima B5N2 (Kate). The code-names were given to the aircraft by the Allies, who felt the Japanese names would not 'stick' for identification purposes. By the time of the Battle of the Coral Sea in May 1942, these two aircraft types were responsible for the loss to the Allies of the British carrier *Hermes*, four battleships, two heavy cruisers, and more than 50 small warships and merchant ships. All this for the loss of only 72 aircraft in combat.

Credit for the development of the dive-bomber as a fighting weapon must go to the United States Navy. Small shipboard aircraft could not carry large numbers of bombs big enough to seriously damage warships if they were to be released in a level attack from medium altitude—relying upon a pattern of bombs from a number of aircraft in

formation. Trials during the late 1920s showed that by delivering a single heavy bomb at the lowest possible height—aimed by pointing the aircraft at the target in a steep dive—inaccuracies caused by errors of estimation of the target's speed and the wind speed and direction were minimized. So were the effects of evasive action on the part of the enemy. In 1929, the Boeing F4B-1 fighter-bomber went into service. It carried a single 500lb bomb for delivery in a steep dive attack. It was followed in 1930 by the first in the line of Curtiss 'Helldivers'—the O2C-1 two-seat dive-bomber/reconnaissance aircraft.

The Imperial Japanese Navy issued its first dive-bomber specification in 1931, but it was not until 1934 that the first 'Carrier Bomber' was actually ordered—Type 94 Aichi D1A1. The same basic design also served as the Type 96 Carrier Bomber, with the short designation D1A2—first dive-bomber (D), built by Aichi (A), second production



U.S. Navy

'Val's partner in the twin attack, 'Kate' Nakajima B5N2. This aircraft was different from the B5N1 by virtue of an improved power unit, the Nakajima Sakae 11, giving 1,000hp. Japan produced 1,149 Kates.

variant. Capable of carrying a 700lb bomb-load, this rugged biplane gained notoriety in December 1937, when it sank the American gunboat *Panay* and three merchant ships on the Yangtse River near Nanking.

Even as the D1A2 was entering production, the Japanese navy was issuing a new specification for its replacement. Aichi again tendered a design. This time a two-seat monoplane with a fixed undercarriage. The aircraft flew for the first time in January 1938. After the initial problems had been solved it was ordered in 1939 as the Type 99 Carrier Bomber, or D3A1. It was known to the Allies from 1942 by its code-name, 'Val'. Said to be derived from a German design, the D3A's debt to the Heinkel He 70 was small, the only noticeable similarity was the planform of the outer wing surfaces. With a loaded weight of under 3.5 tons, including over 800lb bomb-load and 1,300lb of fuel, 'Val' had a respectable performance. It had a top speed of 240-mph and was able to climb to 10,000ft in six minutes (faster than the Royal Navy's Fairey Fulmar fighter). The full bomb-load could be carried to a radius of 250 miles and beyond, with ample reserves for form-up after take-off and the attack and then the expected delay before the dive-bomber's turn to land on the carrier.

Flying trapeze

The big bomb—a 538lb or 554lb monster—was carried on an ejector arm. This was a sort of trapeze which extended to hold the bomb clear of the fuselage and the propeller arc. The two smaller 132lb bombs were carried under the outboard mainplanes. The bombs and two Type 97 7.7mm MGs installed above the engine and synchronized to fire through the propeller were all aimed by means of the pilot's telescopic Dive-Bombing Sight Model 2—a computing sight which calculated the angle of dive to make allowance for the path of the bomb after release. The movable rear gun was a Type 92 7.7mm weapon.

'Val' had excellent maneuverability once it had rid itself of the bombs. Many an Allied fighter pilot was unpleasantly surprised by its ability to look after itself in a dogfight. But there was no armor for the crew. They sat over 160 gallons of completely unprotected fuel. One hit even from a light-calibre bullet usually resulted in the destruction of the aircraft and the loss of the crew.

Up to 1934, all Japanese torpedo-bombers were of British design—although built by Mitsubishi. The first totally Japanese-made torpedo-bomber, the Type 92 Carrier Attack Bomber, was not successful. In 1937 this was replaced by the Type 96 (D4Y), designed by the Nakajima

company and built by the Yokosuka Naval Air Technical Arsenal. The Type 96 was officially regarded as an interim type, pending the development and acceptance of a monoplane design called for by a 1935 specification. But the reliable biplane was still in action over China until 1940. The monoplane designs, one by Nakajima and the other by Mitsubishi, appeared in 1937 and were both accepted for production in that year. Nakajima's design was designated Type 97 Carrier Attack Bomber Model 1, and the Mitsubishi the Type 97 Model 2—the respective short titles being B5N1 and B5M1.

There was little to choose between the performance of the two aircraft, but the Nakajima bomber was more advanced technically. It had a retractable main undercarriage and power-operated wing-folding—a feature not seen in Western carrier aircraft for some years after. Despite the extra weight of these fittings, the fully-loaded B5N weighed little more than that of the 'Val', in spite of an additional crew member, another 800lb of fuel, and more than double the war load. Maximum level speed, unladen, was only 10mph less than the dive-bomber's. Entering service in 1937, the B5M and B5N were five years ahead of any Western design in terms of both performance and efficiency. Both were code-named 'Kate' in 1942, although the Nakajima aircraft was the one most commonly encountered—the B5M being used only from shore bases.

The B5N's main anti-warship weapon was the Type 91 torpedo, a 45-knot 17.7in weapon which could be released at heights of up to 250ft and a speed of up to 280mph—higher and faster than any Allied air-launched torpedo. The warhead weight of 770lb (350kg) was also greater than that of its contemporaries—although at 1,760lb (800kg) the overall weight was not exceptional. A particular asset of the Type 91 torpedo was its ability to 'find' its correct running depth quickly after a steep angle of entry and a deep initial dive which would have sent any other torpedo straight to the bottom. 'Kate' tactics were to approach the target at about 12,000ft and begin a shallow dive at about 20 or 25 miles. By the time that they began to level out, within two miles of the target, they were travelling almost as fast as the maximum low-altitude speed of the defending fighters, and over 100mph faster than any other carrier-borne torpedo-bomber at the same stage of an attack. Attacking from two or more sectors, at low level, with dive-bombers coming down simultaneously at steep angles, the 'Kates' split the defenses—guns and fighters alike. Only the most experienced defensive formation could defeat such an attack.



U.S. Navy

'Kate' was also intended for use as a level bomber. The observer/navigator aimed the bombs, using a simple sight—the 'Small Bombing Telescope No 4'. This device was adapted from the German Loetz sight and was able to make allowance for target movement as well as wind speed and direction. The 'Lead Bomber' technique was used—one experienced observer in the leading aircraft of a formation aiming and the remaining aircraft releasing bombs when his were seen to fall. 'Kate' could carry either a single 1,725lb bomb or a number of smaller bombs, often one 554lb and six 132lb bombs. These were all carried in tandem on a single beam carrier under the fuselage. The radio operator/gunner was provided with a Type 92 7.7mm machine-gun for rear defense.

In 1941, a more powerful engine was installed in the B5N, giving the plane an improved take-off performance and raising the maximum speed to 235mph at 10,000ft. The more powerful engine was also 'thirstier'. This reduced the maximum striking radius from 300 miles to 250 miles. This new model was designated B5N2. Most of the carrier units had been re-equipped with the newest 'Kate' by the beginning of December 1941.

At the time of the Japanese attack on Pearl Harbor, on 7 December 1941, there were 162 'Kates' and 135 'Vals' operational aboard seven carriers. The small *Ryujo*, in the Philippines area, had 18 'Kates' but no 'Vals'. Her deck was too short for the dive-bombers' somewhat long take-off run.

Of the six carriers involved in the 'Hawaiian Operation' *Akagi*, *Kaga*, *Hiryu* and *Soryu* were selected for the high-priority targets. Their aircrews were all highly experienced. These targets were the US Pacific Fleet warships docked at Pearl Harbor. The main brunt of the attack was to be delivered by 'Kates'. Forty of these were armed with Type 91 torpedoes modified for release in shallow water by the addition of a wooden 'air tail'. This ensured a shallow angle

JAPANESE BOMBS

Designation	Weight (lb)	Penetration (ins)
Type 97 No 6 Land Bomb	133	8 RC
Type 99 No 6 Ordinary Bomb	138	1 AP
Type 98 No 25 Land Bomb	538	15 RC
Type 99 No 25 Ordinary Bomb	554	2 AP
Type 99 No 80 Mark 5 Bomb	1,725	6 AP
Type 98 No 7 Incendiary Bomb	145	0.5 AP

(AP = armor plate; RC = reinforced concrete)

Note: the 'Land' designation was the Japanese equivalent of the Allied 'Medium Capacity', with a filling case weight ratio of about 40:60; the 'Ordinary' bombs were the equivalent of 'Semi Armor-Piercing', with a 25% explosive filling. The Type 99 No 80 bomb was carried by 'Kate' and had only 3% explosive filling.

of entry into the water. Another 50 bombers were each armed with a 1,725lb Type 99 No. 80 bomb. This bomb was a 16in armor-piercing naval shell adapted for use in the air by the addition of stabilizing fins and suspension lugs. *Shokaku* and *Zuikaku* did not enter service in time for their newly-formed air groups to take part in the special training for the attack. Their 'Kates' and 'Vals' were given the task of neutralizing the Oahu Island airfields with 538lb and 132lb medium-capacity bombs.

The first wave of the attack caught the defenses off-guard and despite the failure to explode of a sizeable proportion of torpedoes and armor-piercing bombs, seven battleships and five other ships were sunk or seriously damaged. The 81 'Vals' in the second wave sank or damaged a further eight ships. The bombers which attacked the airfields destroyed or crippled 177 US Navy, Marine Corps and Army Air Force aircraft on the six island airfields. This for

◁ A Nakajima B5N2, Navy Type 97 Carrier Attack Bomber Model 12, taking off from a Japanese carrier. The smaller diameter of the Nakajima Sakae 11 engine allowed for a cowling which gave better vision.

Due to a lack of large AP bombs at the time of Pearl Harbor, Kates were armed with 1,764lb (800kg) shells fitted with tails to give stability when used as bombs. Normal Kate armament was the Type 91 17.7in torpedo.

▷ A mixture of nine Zeros and 18 Vals, running-up on the deck of the Akagi before the launch of the second strike at Pearl Harbor. The 36,500-ton Akagi led the Strike Force, which was commanded by Vice-Admiral C. Nagumo. The carrier was eventually sunk by scuttling off Midway on 5 June 1942.

Japanese aviation losses at Pearl Harbor were 29 aircraft out of the 350 that went into that successful attack.

▷ A belly view of the B5N2 Kate, showing the offset 1,764lb (800kg) torpedo. There were 144 Kates at Pearl Harbor during the attack. This aircraft's performance surpassed the US Douglas Devastator.



the loss of one 'Val'! The harbor defenses had rallied quickly and five 'Kates' and 15 'Vals' were shot down. Also, nine 'Zero' fighters were lost in action around the island. The high proportion of dive-bomber losses reflected the extreme vulnerability of the 'Val'.

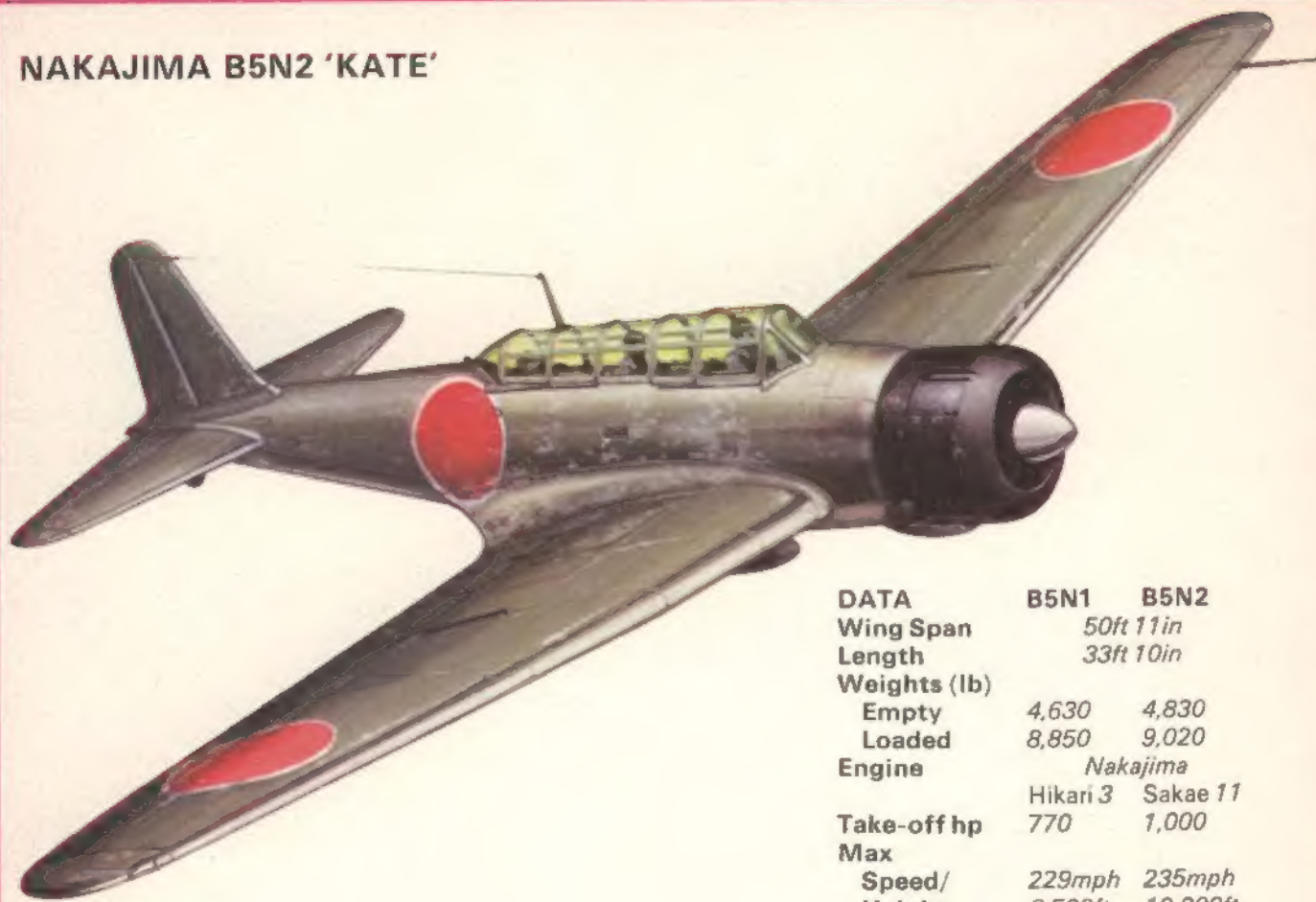
In the Philippines, *Ryujō's* 'Kates' were used as level bombers, attacking targets on land and sea. They were not spectacularly successful against shipping, but the possession of a carrier gave the Japanese a tremendous advantage over the Allied fleets in the East Indies area.

After operations in support of Japanese landings at Rabaul and on Ambon Island, *Akagi*, *Kaga*, *Hiryū* and *Soryū* arrived in the Indian Ocean to assist in the Java campaign. They sealed off the island from Allied reinforcements from

or evacuation to Australia and India. The cruise began with a devastating raid on Darwin, Northern Australia. Here the 'Vals' sank 11 ships and the level-bombing 'Kates' all but obliterated the military installations and stores dumps ashore. The only aircraft to be lost out of the 188 which attacked was a 'Val'—shot down by USAF Curtiss P-40 fighters. This raid, on 19 February 1942, was followed by two weeks of searches and attacks which accounted for another 12 ships sunk and six damaged at sea. Twenty more were sunk in Tjilitjap harbor on 5 March. To the north of Java, *Ryujō's* bombers sank an American destroyer.

The first real check came a month later, when *Akagi*, *Hiryū*, *Soryū*, *Shōkaku* and *Zuikaku* attacked Colombo, Ceylon. Thirty-six 'Vals' and 53 level-bombing 'Kates' were

NAKAJIMA B5N2 'KATE'



DATA	B5N1	B5N2
Wing Span	50ft 11in	
Length	33ft 10in	
Weights (lb)		
Empty	4,630	4,830
Loaded	8,850	9,020
Engine	Nakajima	
	Hikari 3	Sakae 11
Take-off hp	770	1,000
Max		
Speed/	229mph	235mph
Height	6,500ft	10,000ft
Ceiling	24,300ft	25,200ft
Fuel (galls)	253	255
Range	1,414	1,238
	(max.) Statute Miles	



A Kate, all power on, during take-off with a torpedo. All three cockpit canopies are wide open to give the three-man crew air. A Japanese caption to this photograph says rocket-assisted take-off was used here.

intercepted by RAF and Navy fighters. Although no 'Kates' were shot down their concentration was upset and they sank only two ships and damaged three more out of the 34 ships in the harbor. The 'Vals', from *Shokaku* and *Zuikaku*, lost six of their number over the airfields but claimed four out of the 16 British fighters to be lost.

Shortly afterwards, 53 'Vals' took off from *Akagi*, *Hiryu* and *Soryu* to attack the British heavy cruisers *Cornwall* and *Dorsetshire*, to the south of Ceylon. The dive-bombers sank the cruisers in 19 minutes. Only one 'Val' was lost. These victims were the first major warships to be sunk in the open sea by Japanese carrier aircraft.

Four days later, on 9 April, 91 'Kates' bombed Trincomalee—the main naval base on Ceylon. Twenty-two British fighters intercepted the bombers, but the 'Kates' could take punishment. Although 12 were hit only two failed to return to their carriers. As off Colombo, however, the main honors of the day went to the 'Vals'. The small RN carrier HMS *Hermes*, without aircraft on board, was spotted, together with four other naval vessels and a hospital ship, to the south of Trincomalee. No fewer than 85 'Vals' from all five carriers took part in the attack. Nine out of ten aircraft scored hits—sinking the legitimate targets but respecting the hospital ship. Four of *Soryu's* 18 dive-bombers were shot down by Royal Navy Fulmar fighters which arrived as the ships were sinking. But the other 'Vals' turned on the fighters and shot two down. *Hermes* had been virtually defenseless, but to 'Val' goes the honor of sinking the first carrier to succumb to air attack alone.

While the 'Kates' from the big carriers were not enjoying much success, *Ryujō's* 16 aircraft were usefully employed in the Bay of Bengal—hunting down merchant shipping fleeing from Ceylon. On 5 and 8 April, 11 ships were sunk and two damaged by the 'Kates', which suffered no loss.

Price of the Lexington

Not until early May 1942 did the Japanese and American carriers meet in battle—in a series of engagements known as the Battle of the Coral Sea. The lack of experience of *Shokaku's* and *Zuikaku's* aircrew in shipping strike work was displayed on 7 May, when no fewer than 60 bomber sorties were needed to sink an oiler and a destroyer. They were identified by a carrier reconnaissance aircraft as a carrier and a light cruiser. This action cost the carriers one 'Val', and that evening 23 out of 27 'Kates' and 'Vals' which took off in search of *Yorktown* and *Lexington* failed to return—10 as the result of combat with the Americans and the others from accidents. The attack on 8 May, which resulted in the loss of *Lexington*, compensated for the previous evening's failure—but at a high price. At least 20 of the dive and torpedo-bombers were shot down, most during the get-away.

The main striking force for the Midway operation in early June 1942 was provided by the 'first team' of *Akagi*, *Kaga*, *Hiryu* and *Soryu*, with 90 'Vals' and 78 'Kates'. Involved in the diversionary strikes on the Aleutian Islands were *Ryujō*, with 18 'Kates' and the new *Junyo*, with the same number of 'Vals'. Another 19 torpedo-bombers were aboard *Zuihō* and *Hoshō*, supporting the battle squadrons. Neither America nor Japan derived much benefit from the Aleutian raids.

The Battle of Midway began on 4 June 1942 with a strike against the island by 72 'Kates' and 'Vals'. They were launched before the Japanese learned that they were opposed by carriers. When the strike returned, less six

bombers shot down and as many damaged, there was indecision as to whether to attack the just-reported American fleet, or to revisit the Midway airfield.

The Douglas Devastator and Dauntless attacks from *Yorktown*, *Enterprise* and *Hornet* took place before any aircraft could be launched for either task. The American dive-bombers inflicted fatal damage on three carriers—leaving only *Hiryu* unscathed. She launched all 18 of her 'Vals' as soon as possible, and followed up two-and-a-half hours later with nine of her 'Kates' and one from *Akagi*. Seven or eight of the dive-bombers managed to erode the American fighter patrols and scored three hits on *Yorktown*. These hits were costly. Only three 'Vals' returned to *Hiryu*. The 'Kates' broke through as well and scored one torpedo hit—at the cost of five of their number. *Hiryu* was then savaged by Dauntless dive-bombers which pounded her to a blazing hulk. *Yorktown*, limping though she was, would probably have survived had she not been spotted and torpedoed by a submarine.

The US Marines invaded Guadalcanal Island on 7 August 1942. Six months of bitter fighting followed in which both sides suffered heavy air and naval losses—both in day-to-day fighting as well as 'set-piece' battles. For torpedo attacks and level bombing, the Japanese used the Mitsubishi 'Betty' twin-engined bombers based at Rabaul, so that 'Kate' was not employed very much during the campaign. The 27 'Vals' of the 33rd Air Group, which had taken part in the Java campaign, were flown from an airfield on Buka Island. The Guadalcanal area, however, was at the extreme limit of their radius of action. In their first attack, on 8 August, 14 out of 18 were lost—several simply ran out of fuel. After this, the dive-bombers were not used for regular raids but were held in reserve for special operations.

There were two carrier battles off Guadalcanal—the Battle of the Eastern Solomons on 24 August and Santa Cruz (see 'War Monthly' issue 13) on 26 October 1942. In the first, 38 'Vals' from *Shokaku* and *Zuikaku* damaged *Enterprise*, but lost 18, while the 'Kates' enjoyed no success at all. At Santa Cruz, the survivors of the Pearl Harbor veterans scored their last success—sinking the carrier *Hornet* with torpedoes and bombs, and damaging *Enterprise*, a battleship and a light cruiser by bombing. Two 'unofficial kamikaze' attacks were made, one by a 'Kate' on a destroyer, and the other by a 'Val' on *Hornet*. The true kamikaze suicide group was not then formed. Both aircraft hit their marks. The cost was again heavy. At least 60 Japanese attack-aircraft were shot down. At the time of the Battle of Guadalcanal, during the second week in November 1942, the only Japanese bombers at sea were the 27 'Vals' and 18 'Kates' aboard *Junyo* and *Hiyo*. *Hiyo* lost 12 dive-bombers in an attempt to attack shipping off Guadalcanal during the battle.

A more powerful variant of 'Val' entered service in September 1942 and was in action at Santa Cruz. This was the D3A2, fitted with a 1,200hp engine. Fuel capacity had been raised from 160 gallons to 237 gallons. The new aircraft had a top speed of 267mph at 20,000ft and a radius of action of 330 miles. The maximum bomb-load was not increased and crew or fuel protection was not incorporated.

The Solomons island campaign continued to sap Japanese naval air strength throughout 1943. The rebuilt carrier air groups disembarked at Rabaul in early April. 'Vals' took part in two strikes in the area, losing 15 out of the 89 planes involved and sinking five ships. The carrier aircraft returned to their ships later in the month, leaving the shore-based



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◁ By the use of two dive-bombers and two torpedo-bombers, the AA defenses of a warship can be swamped. The two dive-bombers would attack from a height and each aim for one end of the ship; the two low torpedo-bombers would come in from port and starboard. This gave the ship little room for the standard maneuver to avoid torpedo attack, which was to steer towards the torpedo tracks, thus showing a more narrow profile.

◁ In a huge explosion, the doomed USS Lexington's magazines erupt. Kates and Vals pounced on the US carrier, which was hit by torpedoes and bombs.

▽ A remarkable photograph taken from the deck of a US carrier, the Yorktown. The AA defenses of the ship poured shells into the path of this attacking Japanese Kate. It needed just one piece of shrapnel, or one bullet from an MG to hit the aircraft's unprotected fuel tanks. This was the result: before the pilot had time to release his torpedo the plane burst into flames and went out of control.

USNA



'Vals'—joined later by 'Kates'—to fight the advancing Allied forces. These aircraft suffered heavily for few rewards. They lost 209 of their number between May and November 1943. The carrier air groups returned in November, this time to strike at the ships supporting the landings on Bougainville Island. American carrier air superiority was by now almost total. When 27 'Vals' and 14 'Kates' tried to attack a carrier force near Rabaul, the Hellcats and Corsairs destroyed all the torpedo-bombers and 17 dive-bombers.

'Kate' was clearly unable to deliver a successful daylight attack on warships. But she was to score two more successes when used for night attacks. On 4 December, 'Kates' based in the Marshalls Islands joined 'Betties' in a series of day and night torpedo attacks on an American carrier striking force. The new *Lexington* was torpedoed by a 'Kate' shortly before midnight and had to be withdrawn for extensive repairs. Seventeen 'Kates' and 18 'Betties' were sacrificed for this one hit.

On 17 and 18 February 1944, aircraft from nine fast carriers struck at Truk Atoll, the main Japanese advanced base in the SW Pacific. Over 250 Japanese aircraft were destroyed and damaged in the air and on the ground. Six 'Kates' struck back after dark on the 17th, slipping past a radar-equipped night-fighter and inflicting a hit on *Intrepid*—putting her out of action for months.

The last major carrier battle took place on 19 and 20 June 1944, west of the Marianas. Nine Japanese carriers took part, but only four had 'Vals' and 'Kates' as principal types while the two large carriers *Shokaku* and *Taiho* had seven between them. *Junyo* and *Hiyo* were unable to operate the new Yokosuka 'Judy' dive-bombers, which had an even longer take-off run than 'Val'. Therefore, she retained 27 of the older dive-bombers, while the smaller converted carriers operated 'Zero' fighter-bombers. The new torpedo-bomber embarked in seven carriers, was the Nakajima B6N2 'Jill', but the smallest ships, *Chitose* and *Chiyoda*, had to be armed with the lighter 'Kates'. There were nine aboard each ship.

On 19 June, the 'Kates' were used as scouts, shadowing the vast American carrier force. Ten were lost to the defending Hellcats. The 'Vals' from *Junyo* and *Hiyo* never got close to the enemy and 20 were shot down—out-dated aircraft pitted against a modern defensive system.

After 'The Great Marianas Turkey Shoot' the useful life of both 'Kate' and 'Val' was over as carrier-based strike aircraft, but other jobs were found for them. American submarine activity was steadily strangling the Japanese

war economy by inflicting savage losses on shipping between the Home Islands, China and SE Asia. 'Kate' was therefore adapted for anti-submarine warfare by the fitting of 'Model 6 Airborne Radar'. This had a range of about eight miles against a surfaced submarine. From mid 1944 a Magnetic Anomaly Detector was added, with a range of 450ft against a submerged submarine. Flying from shore bases in Kyushu, Formosa and mainland China, as well as from the escort carriers *Kaiyo*, *Shinyo*, *Taiyo* and *Unyo*, 'Kates' of Nakajima and Mitsubishi design were responsible for a few 'kills'. It was ironic, however, that of the carriers three were sunk by submarine attacks, in August, September, and November 1944, only *Kaiyo* survived until August 1945.

The final role for the two aircraft was suicide attack. Introduced in October 1944 as an officially recognized method of war, it was initially delivered by modern aircraft, such as the 'Zero' fighter and 'Judy' dive-bomber. But on 13 December 1944 a 'Val' inflicted heavy damage and serious casualties on USS *Nashville*. She was carrying amphibious forces headquarters staff to the Mindoro Island invasion. The first sinking by a kamikaze 'Val' was that of the tanker *Porcupine*, off Mindoro on 30 December. Further damage was inflicted during the Lingayen Gulf invasion of Luzon Island in January 1945, and the large-scale use of 'Vals' during April and May off Okinawa resulted in the sinking of two destroyers and the damaging of a dozen assorted vessels.

The 'Kates' of the anti-submarine units were also pressed into service for suicide operations in May 1945, armed with a single 1,775lb medium-capacity bomb. They achieved no significant success. They were only used in small numbers, and only 25 were claimed shot down by American carrier fighters. Compare this with 150 'Vals' shot by down British and American aircraft off Okinawa. A 'Val' scored the last kamikaze hit of the war—damaging the destroyer USS *Borie* off Japan on 9 August.

In combination, the Nakajima B5N 'Kate' and Aichi D3A 'Val' were responsible for sinking more Allied shipping than any other air attack team. Always vulnerable to heavy losses against strong opposition, their success declined sharply from the autumn of 1942 when the last of the experienced aircrews perished in the struggle for Guadalcanal. The obsolescence of the aircraft and the inexperience of the crews after Guadalcanal led to increasingly heavy losses for meagre rewards. By June 1944, the successes at Pearl Harbor, Darwin and Java were but a memory. David Brown



ARMAGEDDON 1918

Jerusalem was taken as a 1918 Christmas present for the British. It set the scene for today's state of Israel

Since 1481 BC nine great battles have been fought in the Biblical place of final conflict—Armageddon. The ninth among the mountains around the Plain of Megiddo overthrew the 400-year-old Ottoman Turkish Empire in Palestine and Syria during 38 dramatic days of 1918. It was the first milestone on the road that led to the establishment of the State of Israel and the liberation of the Arabs. It was also the last and greatest achievement of British cavalry *en masse*—the last battle in which the horsemen would reap the spoils of victory on the grand scale.

For two and a half years Britain's war with Turkey had languished in the context of World War I. Large forces in Egypt had been diverted to Gallipoli or tied down defending the Suez Canal before advancing very cautiously and painfully across the Sinai Desert. In the spring of 1917 an attempt to conquer Palestine came to grief at Gaza where the British army blundered around in a fog. A second failure earned General Sir Archibald J. Murray his recall. He was replaced in June by General Sir Edmund H. H. Allenby, one of Sir Douglas Haig's five BEF army commanders in France. The Prime Minister, David Lloyd George, singled him out as the one most fit for independent command.

Allenby's task was to capture 'Jerusalem by Christmas as a present for the British nation.' He was to have the neces-

sary reinforcements. On 9 December Jerusalem fell to him after a ruthless cavalry pursuit had exploited alternating blows which fractured the Turkish army on the Gaza-Beersheba front. Apart from the capture of Baghdad (11 March 1917) on the other, oil-inspired front against Turkey in Mesopotamia (Iraq), it was the only unequivocal Allied triumph in a year of calamities.

In mid-February 1918 the British War Cabinet decided that the main effort to knock Turkey out of the war must be made in Palestine and not Mesopotamia. Allenby resumed his advance despite the still-unfavorable weather. On 21 March, however, and succeeding days the British and French armies in France, wilting under the great German *Michael* offensive, came as close to defeat as at any time during the war. Allenby was ordered to send 60,000 British troops to France. Although this bled his own army white to save Haig's from the same fate, Allenby complied with alacrity and good grace. While two cavalry raids and a limited attack in the Judean hills did not yield all the hoped-for results, their place was gradually taken during the summer by poorer-quality Indian units. The final result of a complex reorganisation was an army as heterogenous as any in the British Army's history: the weekly newsletter had to be printed in English, Arabic, Hebrew, Hindi, Urdu and

Gurmukhi.

By September, the Desert Mounted Corps consisted of four cavalry divisions—the 4th (Major-General George de S. Barrow) and 5th Cavalry Division (Major-General H. S. Macandrew), the Australian Mounted Division (Major-General G. W. Hodgson) and the ANZAC Mounted Division (Major-General E. W. C. Chaylor). Each had three brigades of three regiments. In the 4th and 5th Cavalry Divisions there were five British Yeomanry regiments. The other 13 units were regular Indian cavalry regiments with such glamorous names as Hodson's Horse, Deccan Horse, Poona Horse, Central India Horse and 19th Lancers. A regiment of *Chasseurs d'Afrique*, advertising French interest in Palestine, provided a picturesque addition. All were armed with the sword or lance as well as rifles except the ANZAC Division who decided to remain mounted infantry. The Australian Lieutenant-General Henry G. Chauvel was the Corps commander. He and his four divisional commanders were all able leaders of battle-experienced horsemen.

Infantry who had never fired a rifle

It was otherwise with the seven infantry divisions, of which only one was entirely British. The rest had three Indian and one British battalions in each of their three brigades: less than half of the Indian battalions had seen active service. In some battalions, one third were recruits who had never fired a rifle. All were short of signallers, Lewis machine-gunners and grenade-throwers. Very few of their junior British officers could speak Hindustani and not many Indian officers had much knowledge of English. But all were of fine physique, eager to learn and responsive to high-pressure training. The artillery, with the exception of the redoubtable South African Field Brigade, was entirely British.

Major-General Geoffrey Salmond, C-in-C of the newly independent RAF in the Middle East, was not really under Allenby's command. But he regarded Palestine as his main responsibility and placed the Palestine of seven squadrons, including one Australian at Allenby's disposal. The aircraft were Bristol fighters and one twin-engined Handley Page bomber which could carry 16 112lb bombs and remain in the air for eight hours. The Bristol, a remarkably robust and versatile machine, was expected to be and succeeded in being a fighter, bomber, reconnaissance and close-support aircraft rolled into one. It could operate from improvised landing grounds, pick up messages with a grapnel and observe for artillery fire. By September, RAF air dominance of the battlefield was complete.

Between the Mediterranean and the Hejaz Railway on a 70-mile front the Turks had three so-called armies whose fighting strength, artillery apart, was that of three weak divisions. The Eighth Army (HQ Tulkarm) contained four divisions and Asia Corps—a German force of three infantry battalions, well equipped with over 90 machine-guns, 30 guns and trench mortars. These 10,000 fighting men held a 20-mile front from the coast. The Seventh Army (HQ Nablus) of five divisions (7,000 rifles) under the formidable General Mustapha Kemal Pasha (later Atatürk), Turkish hero of Gallipoli, continued the line 20 miles more, up to the Jordan. The 8,000-strong Fourth Army beyond the Jordan had only one Corps in contact with the British. The rest, including the German reserve—146th Masurian (E. Prussian) Infantry Regiment—were widely spread in what is now Trans-Jordan. Marshal Liman von Sanders, the German C-in-C and victor of Gallipoli, had his HQ at



Imperial War Museum

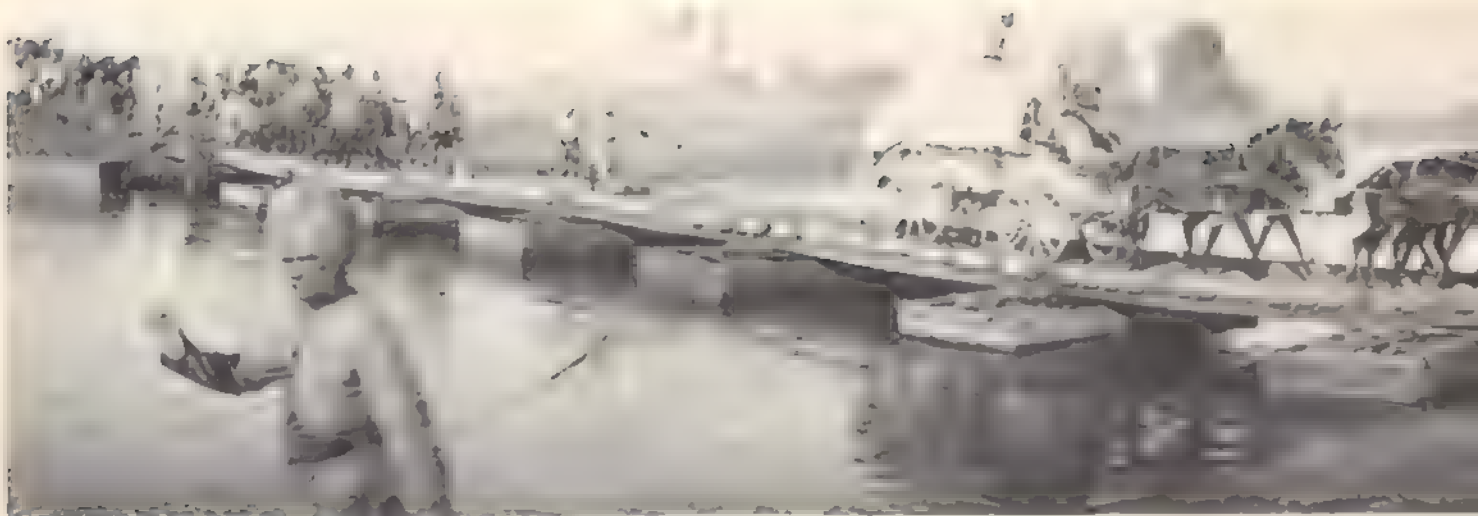
A Rolls Royce armored car of No 12 Armoured Motor Battery north of Aleppo in October 1918 on the eve of Turkey's surrender. This unit fought alongside the Jodphore and Mysore lancer regiments at Haritan (7 miles NW of Aleppo) on 26 October—last cavalry action of World War I.

Nazareth; his only reserve consisted of 3,000 infantry in three weak regiments.

These three armies, making up the laughably termed *Yilderim* ('Lightning') Army Group, depended for their maintenance on a single narrow-gauge railway from Damascus. It branched at Dera, one line running south to the Hejaz region of NW Saudi Arabia, the other turning west across the Jordan to Afule. From there one branch reached the sea at Haifa and the other ran southwards to the railheads of Seventh and Eighth Armies. Fourth Army east of the Jordan depended on the Hejaz branch. Here the Turks were vulnerable to harassment and sabotage by the Arabs under the Emir Feisal and Lieutenant-Colonel T. E. Lawrence. Turkish morale was known to be in decline. This was mainly due to inadequate supplies, inefficiency and corruption on the lines of communication. But there was nothing to indicate that they would not continue to fight with traditional courage and tenacity in defence.

The size of the opposing force has been disputed. It seems that the Turks had a ration strength of 103,500 as against 140,000 in the three British Corps. Since a superiority of 3:1 was considered the minimum necessary for success on the Western Front, the Turkish numerical disadvantage, 35,000 men and 400 guns facing Allenby's 69,000 men and 540 guns, was not so great as has been alleged. Surprisingly they had almost twice as many heavy machine-guns as the British. The elite German *Afrika Korps*-type contingent of about 6,000 men considerably shortened the odds.

From the map it can be seen that if a grip could be got on Afule railway junction and the Jordan crossings near Beisan, the communications of the Seventh and Eighth



Australian War Museum

Turkish Armies would be severed. This area was within the range of a 60-mile bound by cavalry and armored cars. Furthermore Fourth Army's communications could be cut at Dera, which for the moment was beyond the range of the British.

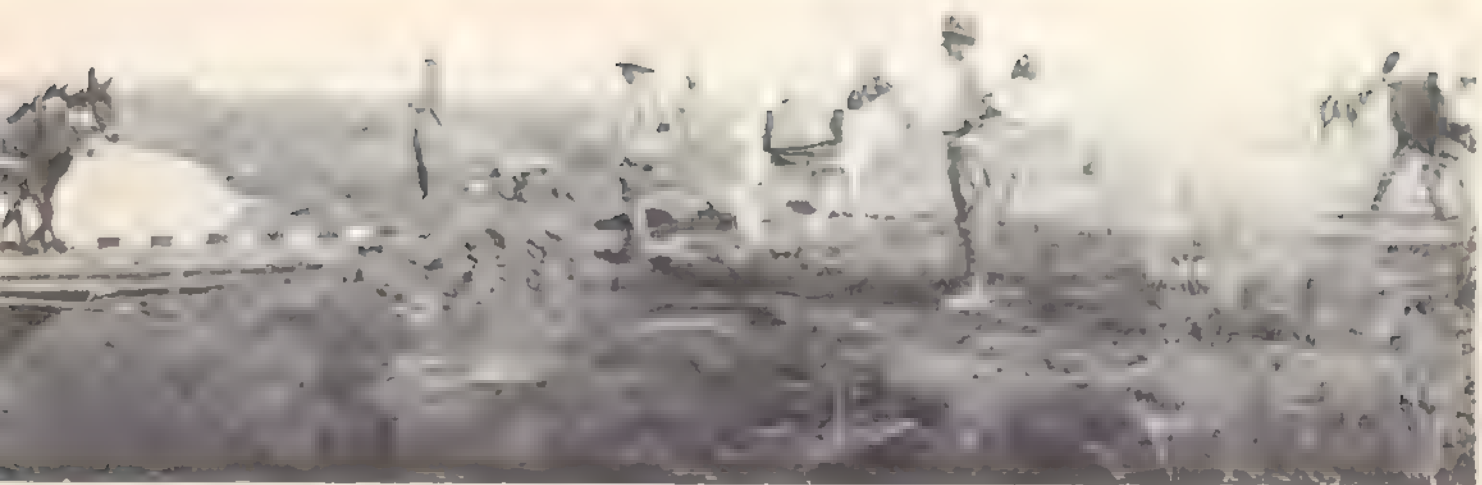
For some time Allenby had been turning over the problem in his mind. One morning in early August he returned from a morning ride, strode into his office and brusquely informed his Operations Staff that he had decided on an extension of his original plan. His aim would now be the complete annihilation of the Turkish Armies. The Desert Mounted Corps was to be used in the coastal plain, not on the desert flank as at Gaza-Beersheba. An infantry Corps would attack and create a gap for them to break out. They would then thrust northwards up the Plain of Sharon and cross the spur of hills about Mount Carmel near Haifa. Aiming for Afule and Beisan they would gain control of the great Plain of Megiddo (Esdraelon) some 40 miles behind the Turkish Seventh and Eighth Armies, and cut off their retreat.

A more daring plan for cavalry had seldom been conceived; it involved a 60-mile advance, crossing a range of hills passable only by two difficult tracks and an immense administrative risk. Later, in conjunction with Feisal's and Lawrence's Arabs, Allenby proposed to seize Dera to cut off Fourth Army. Meanwhile the Arabs were to continue playing on the nerves of the Turks and interfering with the working of the Hejaz Railway so as to keep their attention fixed on the Trans-Jordan front.

A good deception plan must have a clear, plausible and simple aim which every detail of it should support. In this

case Allenby intended to make the Turks believe that his offensive, which they knew to be imminent, would be in the Judean Hills and via the Jordan Valley. Palestine, especially Jerusalem, was full of Turkish spies whom it was easy to feed with false information. In Jerusalem, a hotel was taken over and converted into a dummy GHQ in which telephones were installed and rooms allotted. Bridges, one still known as Allenby's, were built over the Jordan. Fifteen-thousand dummy horses made of canvas took the place of the real horses of the Desert Mounted Corps when they moved west. Mule-drawn sleighs were used to raise dust at the times when the canvas horses should have been going to water. A race meeting at Jaffa on 19 September was widely advertised. Labor battalions of West Indians marched ostentatiously every day down to the Jordan Valley to be brought back by lorry at night to repeat the performance next day. When the cavalry left the Jordan for the coast all tents were left standing. Old and unserviceable tents were pitched to indicate an increasing rather than diminishing number of troops. Outside the valley no fresh tentage was put up.

The troop concentration on the west flank was carried out in the utmost secrecy; only a handful of senior officers knew the full details of the plan. All movement was at night. In the concentration area near the coast, bivouacs and camps were classified as 'open' or 'concealed'; the former were those with which the enemy was familiar and these were without restriction unless increased in size. In the 'concealed' bivouacs among the orange groves and on the shore below the cliffs, movement between 1630 and 1930



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△△ Egyptian-driven wagons of 5th Cavalry Division on one of two pontoon bridges over the river Auja (4 miles north of Jaffa) which the horsemen crossed earlier prior to their breakout along the seashore. Four nationalities of the many in Allenby's army can be seen.

◁ ANZAC Mounted Div., second battle of Gaza, April, 1917.

△ T. E. Lawrence with bodyguard at Akaba, August 1918.

and all cooking, except with solidified alcohol, was forbidden. All these measures however would have been futile but for the RAF which in July and August denied the skies to the four squadrons of German fighters in Palestine. Only four planes crossed the British lines during this period and they failed to spot the change in the situation. Up to the last moment, despite the desertion of a *havildar* (an Indian sergeant) on 17 September who betrayed the coastal plain attack, the Turks continued to believe that it would be on the other flank. Liman von Sanders may have suspected that the deserter was 'planted' as a ruse.

Allenby's confidence at his final conference made an immense impression on all present and especially on Brigadier-General Archibald P. Wavell, the future World War II Middle East C-in-C, who described it as 'almost overpowering'. He had good reason. When night closed in on the evening of 18 September, Allenby's deployment was complete. Unsuspected, he had massed 35,000 infantry (5½ divisions), 9,000 cavalry (3 divisions) and 384 guns on a 15-mile front. On the same front the Turks had only some 8,000 infantry from four divisions and about 120 guns. The Napoleonic prescription for victory—superior force at the

decisive time and place—had been fulfilled. Wavell later considered that the campaign had been almost won before a shot was fired. This was to be no soldiers' battle in which courage and fighting skill would compensate for a commander's mediocrity but a brilliant maneuver by a master of war.

On Allenby's orders, the Arabs under Feisal and Lawrence cut the railway line in three places between Dera, Damascus, Afule and Amman (16-17 September) and the RAF bombed Dera. Soon after dark on the 18th Lieutenant-General Sir Philip Chetwode's 20th Corps, with only two divisions on either side of the Nablus road, got troops over a steep ravine in readiness for the morning's full-scale attack.

On the main front no preliminary bombardment warned the Turks of the wrath to come. On the stroke of 0430 the massed artillery and the 4in guns of the off-shore destroyers *Druid* and *Forester* opened up with paralyzing effect. Over a thousand shells a minute descended on the Turkish trenches and battery positions. Within minutes the infantry of 21st Corps were swarming into the Turkish trenches by the earliest light of dawn. Meanwhile the RAF started their own bombardment of all the nerve-centers behind enemy lines. Afule and the army HQs at Tulkarm and Nablus were raided and their communications with Liman von Sanders cut. Bristol fighters, unopposed, ranged along the roads blocking them with smashed transport and dead and wounded horses. The Tulkarm-Nablus road was soon an inextricable shambles. British fighters hovered like hawks above the enemy's three forward airfields and kept his aircraft grounded. Meanwhile, the infantry surged on, barely



Imperial War Museum

40 yards behind the shells of a creeping barrage of exceptional accuracy.

The advance of 21st Corps has been described as 'exactly that of men pushing open a wide and heavy door of which the hinges were in the foothills and the handle on the coast'. Here, near the sea, 4th and 5th Cavalry Divisions stood ready to break out. By 0700 the 5th began to move forward along the beach in the shelter of the cliffs, while the 4th burst through the old front-line hotly followed a little later by the Australian Mounted Division. By 1000, they were clear of the enemy's rear defenses and in open country with only demoralized Turks ahead of them. The great ride began towards the two narrow and easily defensible defiles in the seven-mile belt of hills which separate the plains of Sharon and Esdraelon.

The 2nd Indian Lancers, advance guard of 4th Cavalry Division, reached the mouth of the more important Musmus pass at about 2300. Coming up to see them about midnight Maj.-Gen. Barrow discovered to his horror that his main body had taken the wrong turning. Directing 2nd Lancers to push on, Barrow drove back, managing to direct his rear brigade towards the pass in the nick of time and to round up the rest of the stray horsemen. A few minutes before day-break on 20 September the 2nd Lancers and the armored cars surprised about 100 Turks in the pass, sitting round fires with their weapons piled. They promptly surrendered.

By first light they had shaken themselves clear of the pass and deployed into the Plain of Megiddo on a three-squadron front. Ahead was the Turkish 13th Depot Regiment who had failed to reach the pass overnight and had therefore taken up a position in the plain to prevent the cavalry debouching from it. Given covering fire by one squadron and the armored cars, about 250 lancers charged home on the Turkish flanks ignoring the wild shooting of four machine-guns and the riflemen. Forty-six Turks were skewered on their lances and the other 470 captured, not a man escaping.

Within 40 minutes the Indian cavalry were on the move again with the rest of the division close upon their hooves. By 0800 on the 20th they had reached the railway junction at Afule capturing 10 engines and three aircraft. Almost simultaneously 14th Brigade of the 5th Division arrived. Meanwhile that division's leading 13th Brigade had burst into the streets of Nazareth with the dawn. Here they struck stiff opposition from German clerks and orderlies who fought to a finish in the houses. Unfortunately no one could find Liman von Sander's billet and he succeeded in

escaping in his pyjamas, according to his housekeeper. By 1800, on what was only the second day of the offensive, the 4th Cavalry Division had seized the crossings over the Jordan and concentrated at Beisan. They had covered 70 miles in 34 hours.

Farther south, the 5th Light Horse Brigade of the Australian Mounted Division had caught up with a large body of Turks at Jenin; 1,869 men surrendered to their vanguard. The loot here was impressive and attractive, including 120 cases of champagne and a wagon-load of gold. Pandemonium reigned in the town as the Arabs, men women and children, hurled themselves on the vast stores of food and clothing. It was near here that Lieutenant R. R. W. Patterson, with two heavy machine-guns of the 10th Australian Light Horse (ALH) Regiment, missed his way in the dark and clashed at 2100 with a large column of Turks. Advised by Lance-Corporal T. B. George to bluff it out, he promptly opened fire and called upon them to surrender. Fortunately the column had an English-speaking German nurse who was ready to interpret. Patterson's bluff that there was a large force behind them came off. The whole force 2,800 strong with four guns, surrendered to Patterson's 23 Australians.

Even more dramatic was the RAF's work on the Wadi El Fara road as described by Lawrence of Arabia: 'But the climax of the air attack and the holocaust of the miserable Turks, fell in the valley by which Esdraelon drained to the Jordan and by Beisan. The modern motor road, the only way of escape for the Turkish divisions, was scalloped between cliff and precipice in a murderous defile. For four hours our aeroplanes replaced one another in series above the doomed columns; nine tons of small bombs and 50,000 rounds of S.A.A. (small arms ammunition) were rained upon them. When the smoke had cleared it was seen that their organization had melted away. They were a dispersed horde of trembling individuals, hiding for their lives in every fold of the vast hills. Nor did their commanders ever rally them again. When our cavalry entered the silent valley next day they could count 90 guns, 50 lorries, nearly 1,000 carts abandoned with all their belongings. The RAF lost four killed; the Turks lost a Corps.'

In less than 48 hours Allenby had destroyed the Seventh and Eighth Turkish Armies taking 25,000 prisoners: barring demoralized fugitives, only the Fourth Army now remained. On the 23rd the Desert Mounted Corps pushed on to Haifa, Acre and Tiberias; the conquest of Palestine was complete. Meanwhile 'Chaytor's Force' consisting of the ANZAC



Camera Press/Imperial War Museum

△ Gen. Allenby (1861-1936) the cavalryman who after 2½ years of static trench warfare in France found Palestine ideal for the mounted man. At Beersheba and Megiddo the mobility and shock value of cavalry were pre-eminent.

◁ Armageddon's harvest, a column of 3,000 POWs on the 12-mile Ras-el-Ain/Lydda road Germans lead their Turkish comrades of Asia Corps into captivity. Two German battalions, 702nd and 703rd, were badly hit in the first two days of the British offensive. The 21st (infantry) Corps took 12,675 prisoners and 149 guns during its advance up to Beirut

▷ Victory with a 140-mile advance in 14 days.

Quotation from 'Seven Pillars of Wisdom' by T. E. Lawrence, by kind permission of the Seven Pillars Trust, Jonathan Cape Ltd and Doubleday & Co Inc.



Davis Harrison & P. Ltd

Mounted Division, an Indian Brigade and a Jewish Brigade, had thrust into what is now Trans-Jordan and pushing on to Amman cut off a complete Turkish Corps which surrendered 4,600 men without a blow on the 29th.

On his way back to Damascus Liman von Sanders had ordered a stand to be made on the natural defense line of the Yarmuk valley from Semakh to Dera. At 0425 on the 25th, whilst it was still dark, the 11th ALH Regiment approached Semakh railway station at the southern end of Lake Galilee to be greeted by intense machine-gun fire. Lieutenant-Colonel J. W. Parsons at once brought the 12 guns of his machine-gun squadron into action, firing at the flashes in front. Swinging the remainder of his regiment to the right, formed it into line and ordered 'Charge'. In the

dim light, two squadrons, yelling as they rode to warn their machine-gunners of their progress, galloped up to the station buildings. There, dismounting, they engaged the enemy within with the bayonet. Some, behind a stout stone wall and in engines and trucks in the sidings, resisted obstinately. The fight raged for a full hour, quarter being neither asked nor given until every man of the defenders had been killed or wounded. The dead included over 100 Germans. In the village itself the fighting was less severe and 364 prisoners were taken. The Australians lost 78 men and 100 horses, mainly after dismounting. Next morning Allenby issued his orders for the advance on Damascus. An infantry division was to march along the coast to Beirut followed by another if necessary. The Desert Mounted



◁ The official British entry into Damascus, 2 October 1918 Australian Lt. Gen. Chauvel rides ahead of his bodyguard—a squadron of ALH Bde., ANZAC Mtd Div.
 ▽ German machine-gunner of 146th Masurian (E. Prussian) Infantry Regt. with a 39lb 1908/15 Maxim gun. His unit of three battalions (Lt. Col. Freiherr von Hammerstein-Gesmoold) was last to leave Damascus, escaping to Homs, avoiding the Barada Gorge death-trap.

Corps at maximum speed, regardless of the exhaustion of man or beast and on short rations, was to make for Damascus. Lt.-Gen. Chauvel promptly ordered the Australian Mounted Division and 5th Cavalry Division to the direct road via Kuneitra, a town fought over again in 1967 and 1973. Meanwhile 4th Cavalry Division was to ride to Dera, make contact with the 4,000-strong Arab army there and, co-operating with them, push on via the ancient pilgrim's road to Damascus, destroying the scattered columns of the Fourth Army en route.

Accordingly on the evening of 27 September their leading brigade, after a brush with the enemy, reached its day's objective about three miles west of Dera and halted for the night. Both men and horses were tired. The 2nd Indian Lancers, sent forward just before nightfall, closed in to the edge of the hills overlooking Dera, and saw the buildings and sidings swarming like an ant's nest. They took all this bustle to be that of the Fourth Army in retreat. In fact, Arab irregulars and the local inhabitants were looting the abandoned station. According to Lawrence, 'With local help the Rualla plundered the camp especially finding booty in the fiercely flaming storehouse whose flaming roofs imperilled their lives; but this was one of the nights in which mankind went crazy, when death seemed impossible however many died to the right and left and when others' lives became toys to break and throw away

The 10th Cavalry Brigade were battle-hardened but the sight which met their eyes when they rode into Dera next morning was more ghastly than anything they had ever seen. Everywhere there were dead Turks—but they were lucky. The wounded, stripped naked and in agony, lay scattered about amidst obscene litter of burnt paper, burst packing cases and smashed machinery. A hospital train stood in the station full of sick and wounded stripped of every rag of clothing; the driver and stoker in the engine cab were still alive but mortally mutilated. Lawrence's army and the local Arabs had indeed taken revenge in a manner as bestial as that of the Turks against their women and children at Tafas the previous day. It was from this massacre that Lawrence had come when he met Barrow in Dera that morning.

That Barrow, whose standards were those of a chivalrous pre-1914 officer and gentleman, should have found association with Lawrence and the Arabs repugnant, is understandable. Leaving 10th Brigade to collect and dress the Turkish wounded and bury the dead with decency, he pressed on with his other two brigades towards Damascus



Malcolm McGregor

➤ Arab cavalry pass a British Ford staff car in Damascus. The Arab Revolt of June 1916, so galvanized by Lawrence, kept the Turkish Mid-East lifeline of the Hejaz Railway under attack for two years. Then the Arab Northern Army joined the race for Damascus. An Australian Cpl of the ANZAC Mtd. Div. with SMLE (Short Magazine Lee-Enfield) rifle. His division remained mounted infantry unlike the Aus. Mtd. Div



on the tail of the demoralized Turkish columns. These were now harried on both flanks by Arab regulars and local inhabitants, who had armed themselves with captured rifles. All organized resistance had now collapsed with the exception of a small body of German and Austrian machine-gunners. Lawrence wrote of them 'for the first time I grew proud of the enemy who had killed my brothers. They were two-thousand miles from home, without hope and without guides, in conditions mad enough to break the strongest nerves. Yet their sections held together in firm rank sheering through the wreck of Turk and Arab like armoured ships, high faced and silent. When attacked they halted, took position, fired to order. There was no haste, no crying, no hesitation. They were glorious'

At Sasa, where the Israeli advance towards Damascus would come to a halt 55 years later, a Turkish-German rearguard of 120 men held up 3rd ALH Brigade for eight hours on the night of the 29th-30th. But 12 hours later all three divisions of the Desert Mounted Corps and the Arab army were at the gates of Damascus. Some Arab irregulars had already entered the city. A few miles NW of the city the Australian Mounted Division had trapped the survivors of the Turkish armies in the Barada Gorge. Some, or at any rate the Germans, attempted resistance but their situation was hopeless. Some struggled through, others turned back whilst the Australians fired and fired till the road was choked with the bodies of men and horses and wreckage

Next morning the Desert Mounted Corps and the Arab army occupied the city amidst scenes of wild confusion and great rejoicing. The 10th ALH Regiment in pursuit of some Germans were the first to enter. Within the barracks over 10,000 Turks, many sick and wounded, surrendered without a fight. Fighting was virtually over. There followed an advance to Aleppo, 200 miles beyond Damascus and 350 miles from the British start-line of 38 days before. Aleppo fell on 26 October, on the 31st Turkey sued for an armistice almost exactly four years since she had entered the war. In the process Allenby's army had taken 360 guns and 75,000 prisoners, including 3,700 Germans and Austrians, at a cost of only 5,666 battle casualties. Militarily, it was as unequivocal and decisive a victory as any in the twentieth century. It remained for the politicians, British, French and Arab, to bring about an enlightened, just and humane settlement of the affairs of the Middle East. That they failed to do so is their tragedy and that of Lawrence. It is with us still.

Hubert Essame



It looks tinny, it feels like a toy. But the Armalite is a lethal and accurate weapon for the modern soldier

'Light, high powered, dependable; a new concept in personal weaponry', so runs the advertising blurb in the US. 'A new experience in shooting pleasure'—'An efficient and deadly rifle, designed to withstand extremes of climatic and adverse conditions'. With these words the civilian customer is wooed into buying the Armalite. In all its versions, the Armalite is a phenomenon of the mid 20th Century. A rifle family which has been entirely successful in both the civilian and military markets. It owes nothing to conventional military design. In its military form it has superseded the accepted and standard weapon of the US Army as well as the armed forces of many other countries. In a very few years it has become one of the most common rifles in the Western World. It is a success in the classic form and as always there were elements of chance, opposition and setbacks before the final triumph.

The story begins in the mid 1950s when the Armalite Corporation joined with the old Fairchild Engine and Airplane Corporation. Armalite was a private company engaged in designing and making small quantities of arms for the civilian market. The merger with Fairchild was intended to marry the techniques of using light alloys and plastics with modern weapon design and up-to-date mass production.

Armalite had had some encouragement with their shotguns and a high quality sporting rifle, called, strangely, the 'Parasnipier'. Although the 'Parasnipier' took a long time to get to its final stage it had an interesting specification and showed the direction in which the company was thinking. At a time when rifles were still being produced by traditional machining and milling processes the 'Parasnipier' had an aluminium barrel with a steel liner and the stock was plastic filled with expanded foam plastic. The rest of the rifle was unremarkable. It was a single-shot bolt-action using NATO 7.62mm ammunition, or any other convenient calibre. The use of unusual materials, however, set the style for the flow of designs that were to follow over the next 10 years.

The company was put on the road to success by the US Air Force. They wanted a replacement for their M4 survival rifle. Armalite produced what they called the AR5. This was a light bolt-action rifle firing the .22 Hornet round. The barrel unscrewed from the body. These two parts could then be stowed inside the plastic butt—an extremely neat and compact piece of equipment for an airman to carry. The total weight was 2½lb and the rifle, whether assembled or stowed, would float. The performance was reasonable within the limitations of the ammunition. USAF adopted the



COLT COMMANDO 5MG

The opinions expressed in this article are solely those of the author. They do not in any way represent the policies of Her Majesty's Government.

The Colt Commando version of the Armalite AR15 (known as the M16 in the US Army), submachine-gun, basically the same as the standard M16 infantry model. Another version of the Commando is based on the M16A1, the differences being a serrated bolt and an external bolt plunger. This enables the bolt to be forced home manually on failure of the return spring.

design in 1957, but it was never ordered in any quantity because there were large stocks of M4 and M6 rifles. Still, Armalite saw that there might be a better market for military weapons rather than civilian ones. They decided to concentrate on the military designs until the company had built up a strong enough reputation to make an impression on the civilian side.

Having made that decision they then reversed it by producing another civilian weapon—a semi-automatic version of the AR5. This was called the AR7 or 'Explorer' and uses long .22 rifle cartridges. It operates by simple blow-back. Like the AR5 it takes down into components which will stow inside the butt, it folds and weighs 2½ lb. It has sold in large quantities in the US where it is a favorite holiday and garden gun.

Succeeding the AR7 was the AR10—the first specifically designed for military use. It was conceived in the mid-1950s when there was a lot of competition among arms manufacturers to produce a rifle for NATO which not only fired the new 7.62mm round, but which also gave a substantial advantage over the then current ex-World War II models. Armalite came up with the AR10 as a basic infantry rifle of

markedly different design and construction from those in competition with it.

As a commercial venture, the AR10 failed because Armalite could not make it themselves. At this stage they had not merged with Fairchild. A Dutch company was licensed to build it. That company was held up trying to get sufficient finance to tool up their factory and by the time the rifle could be produced, FN and others had taken the market. So the AR10 never got into service properly with any army, although the Sudan bought a quantity. A pity, for it was a good rifle.

The AR10 was the first of the Armalites to use direct gas action instead of the conventional piston and cylinder to operate the mechanism. With the direct gas action system gas is tapped off from the barrel, and led back in a tube along the side of the barrel to the breech. The gas is then led right back to the bolt carrier and allowed to impinge directly on to it. The effect is the same as had a piston been used, the bolt carrier is given a sharp push and the normal unlocking and backward action is started. The advantages are fairly obvious. First, there are fewer moving parts and secondly there is less weight. The idea was not new. It had been used in the Swedish Ljungman semi-automatic rifle in 1942 and also in the French MA5 model of 1949. In both these rifles the stream of gas was allowed to act directly onto the front face of the bolt carrier and just push it back. The AR10 improved on this and led the gas into a cavity inside the bolt carrier so that it gave a gentler and less abrupt push.

When the carrier started to move it rotated the bolt out of engagement with the barrel. The locking was by seven small lugs which locked into the barrel extension. Seven may seem a lot to use, but it ensured that locking and unlocking could be fast. It is used in all Armalites today. The usual ejection and feed occurs on the backward and forward motions of the bolt and when the fresh round is finally fed

into the breech the bolt comes to a stop. The bolt carrier continues forward for a short distance to lock the bolt by one final rotation. With no piston or piston extension to push to and fro there is much less inertia in the system when compared with the conventional one, and the stresses are lower.

There are faults however, as both the Swedes and French discovered. By leading the gas right back to the bolt fouling is also carried back. It is deposited on the working parts where it can build up if not frequently cleaned off. The rather abrupt movement of the bolt does not lend itself to a very practical arrangement for primary extraction of the cartridge. In other words there is not the first easing of the case out of the chamber which can be done with conventional gas systems. This lack can result in cases being torn apart by the extractor, or to jamming by a tight case. The AR10 may not have suffered from this, but there is evidence that the AR15 did.

There were other innovations in the AR10. Probably the most significant was the straight-line stock and the almost 'Space Age' appearance of the streamlined plastic furniture, the high-set carrying handle mounted on top of the receiver. It was smooth, workmanlike and functional. Had it appeared when intended it might have stood a good chance of being the NATO rifle. As it happened the FN was chosen and the AR10 has become an interesting collector's piece.

Shortly after forming the amalgamated company with Fairchild Armalite employed a man who was to change their entire fortunes and he was to make the name of Armalite known throughout the world. This was Eugene Stoner, a former US marine and now one of the leading small arms designers in the Western World. Stoner worked for Armalite from 1957 to 1961 and in those four years he produced a spate of designs which took the company from comparative obscurity to one of the leading names in the US. He did so by gifted application of the existing expertise within the Armalite company and by adaptation of proven aspects of different weapons and ammunition.

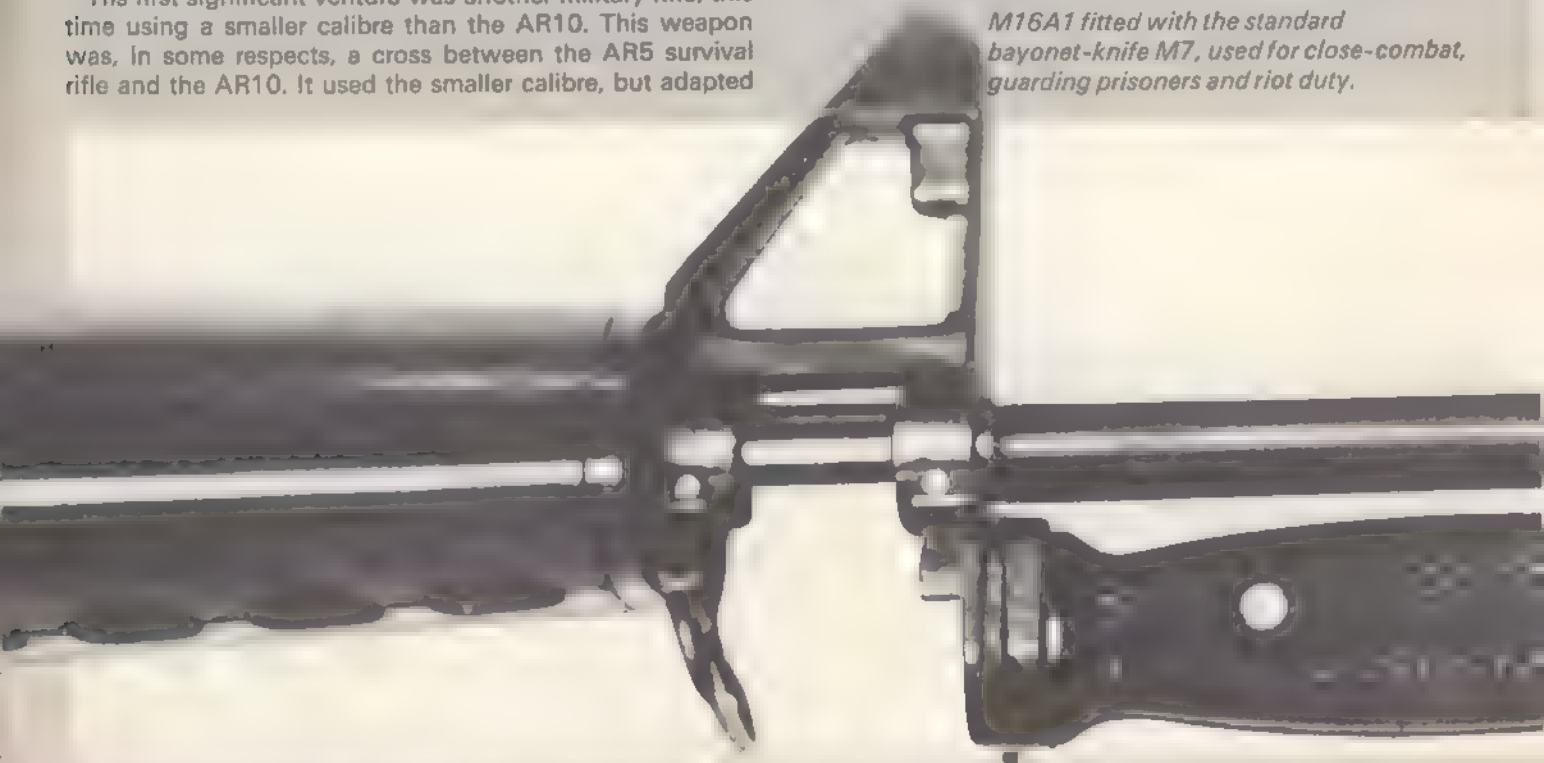
His first significant venture was another military rifle, this time using a smaller calibre than the AR10. This weapon was, in some respects, a cross between the AR5 survival rifle and the AR10. It used the smaller calibre, but adapted

it to the direct gas system and straight line layout. The round was another high-velocity .22. It was developed from a Remington magnum round designed for deer hunting. Stoner modified this round, using bullets specially made for him. He put them into a larger case until he achieved a jacketed bullet of 55 grains with a muzzle velocity of 3,250ft per sec. It was lethal up to 500 yards and was every bit as effective as the larger NATO ammunition. Around this cartridge Stoner built his rifle.

The new venture became the AR15. Outwardly it looked much like the AR10 although it was smaller. There was the same straight line stock, plastic furniture and high-set carrying handle. As with the AR10 as many parts as possible were made by modern methods. High grade die-casting was used extensively to reduce machining to the minimum. It was a new concept in military rifles. No one had ever dared to make one in such a small caliber before. Never had one been made that was so light. It weighed 6½lb. A bit dubiously, the US Army tried it. So did the US Air Force who needed a light rifle for their ground crews and were independent of the Army in what they could choose.

The Army could not make up its mind and a high-powered Board had to be convened to consider all the aspects. Eventually, it came down against the .223 Armalite-Remington round. And that was that for the time being. The Air Force thought differently and ordered a batch for tests. These were completed in 1961 and the US Air Force adopted the AR15 as a standard weapon in January 1962. Shortly afterwards the first US Air Force crews were in Vietnam with their AR15. The Vietnamese Army became interested. It was expanding and was buying arms and ammunition in the US through the off-shore procurement programme. A difficulty was that the average Vietnamese soldier was only 5ft tall and weighed less than 98lb. The standard rifles and machine-guns were too big and heavy for these slender little men, but the AR15 was just right. They bought it and reported enthusiastically on it—as did some of the US Special Forces. When the regular US Army

M16A1 fitted with the standard bayonet-knife M7, used for close-combat, guarding prisoners and riot duty.



arrived in South East Asia a few years later it did not take the GIs long to see that the AR15 was exactly what was needed in the jungle. A torrent of demands poured back to the States.

The US Army still took its time to accept the rifle. For a long time it was condemned as being too fragile, too light and too low in stopping power to be successful as a military weapon. Several trials were carried out to support this attitude. These were later shown to have been highly

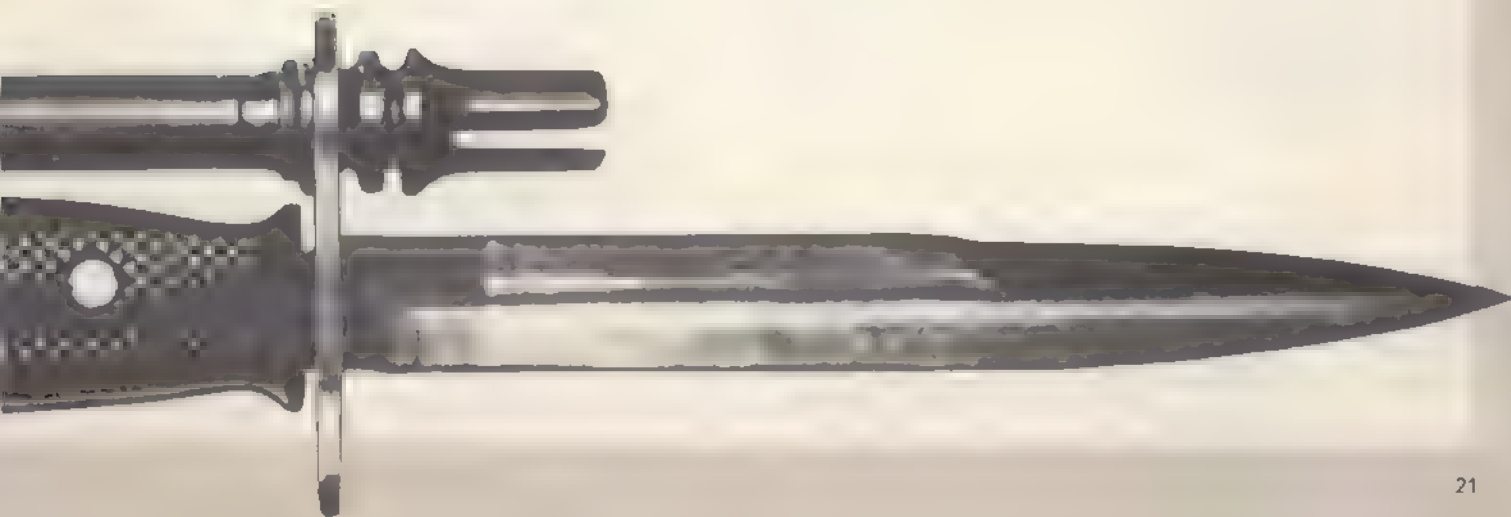
biased. In the end the Army gave in to the weight of opinion and accepted the weapon for limited issue. By now the total orders were so great that Colt's, who had the licence from Armalite, could no longer cope. In late 1966 the US Government was forced to buy out Colt's exclusive contract and go to other firms to meet demand.

The US Army called the rifle the M16, and adopted a modified version known as the M16A1. In this model the cocking handle was moved to the right of the receiver and a



The AR7 Explorer, civil version of the AR5 which was adopted by the USAF. Inset, the Explorer stowed away into the stock. Tools are not needed to disassemble the gun, which weighs 2½lb and floats whether stowed into the butt or assembled. The AR7 is semi-automatic, with an eight-round magazine.

The AR7 Explorer removed from the butt before assembly. It uses 22 ammunition and is a blow-back operated sporting gun. At 100 yards a 5in dia circle group can be made. The barrel is steel-lined aluminium.



special plunger was added to the receiver. This plunger was used to push the bolt home into the breech when the return spring failed to close it. Both USAF and the US Marines rejected the plunger—complaining that it increased the price of the rifle by several dollars. Neither could see a use for it. The Army, however, insisted on it as there had been complaints of rounds failing to feed due to small amounts of dirt on the ammunition. Forcing dirty rounds into the chamber is not the best method of solving this sort of problem.

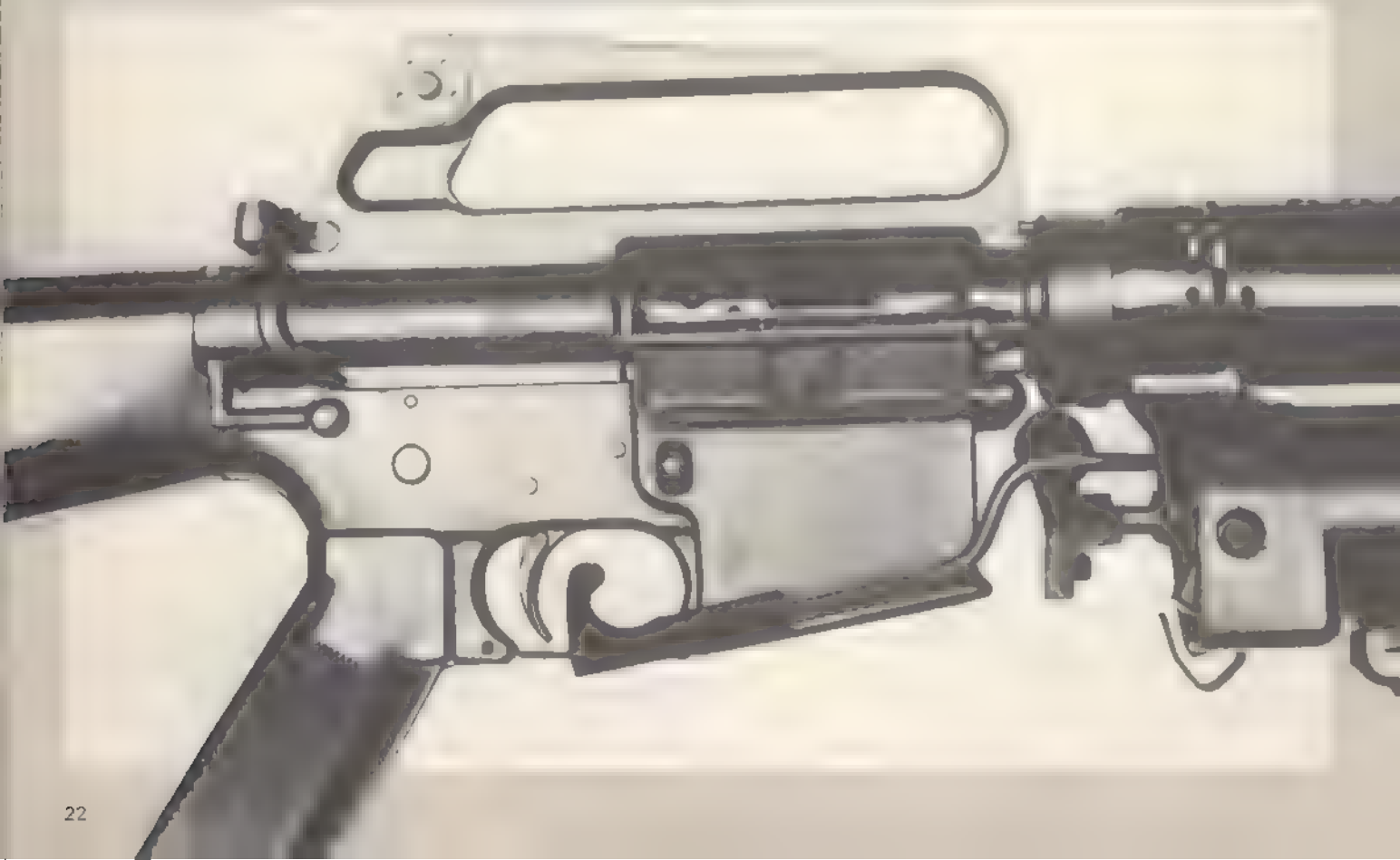
US Army orders were generous. By 1966 405,000 M16A1s had been contracted for. Since the Army was already fully equipped with the M14 7.62mm rifle these huge orders constituted a great triumph for Stoner's design. At the same time it was a small pointer to the wealth of the US. Few other countries have ever been able to afford two sets of weaponry for its army at one time. The M16s were issued on a wide scale by 1965. In enthusiasm for the weapon its performance was sadly misrepresented to the troops who used it. They were told that it was the finest rifle in the world, which is excusable, and that it was not only self-cleaning, but never needed cleaning! Worse still, training in the use of the weapon was poor and incomplete. There were virtually no pamphlets or instructional booklets of any kind.

The result was predictable. By the middle of 1966 there were disquieting reports that the M16 was giving serious stoppages in battle, that confidence in it had been shaken and that casualties had resulted from the rifle jamming or otherwise failing to fire at crucial moments. A special investigation committee found that all this was true and that there were two causes. The first was that without any real knowledge by the military authorities the specification for the propellant had been changed in 1963. This resulted in more dirt and fouling than the rifle was designed to



Bolt assemblies of the M16 (top) and M16A1 (lower) are basically similar. Main difference is the row of serrations running along the right-hand side of the M16A1 bolt (lower)

- 1 Bolt carrier
- 2 Bolt
- 3 Firing pin retaining pin
- 4 Cam pin
- 5 Firing pin



An interesting, non-service version of the Armalite AR15. This experimental short-carbine has been fitted with four selector positions instead of the three on the military M16 and M16A1 models. To the 'Safe', 'Semi' and 'Auto' positions has been added 'Burst'. This gives a three-shot sequence which operates every time the trigger is depressed. The carbine has also been fitted with a 'Sporter Riflescope' giving a x3 magnification.



M16 with dust-cover open, showing bolt and chamber. When firing, the cover opens automatically as the bolt moves back and forward. Beneath the cover is the magazine catch button, which must be depressed when loading and unloading. In front of the trigger is a second trigger for the XM48 40mm grenade-launcher. Grenades can be fired independently of the rifle, and the launcher has its own sights.

accept. The result of this was that fouling built up inside the bolt carrier. When the rifle cooled down the fouling hardened and severely restricted the bolt movement. This was made worse by the US conscript's habit of firing 'automatic' at every opportunity—something the designer had not expected. The second cause of trouble was that the rifles were just not being cleaned. The committee could scarcely credit what they found and their report is full of remarks such as: 'The weapons were in an unbelievable state of rust, filth and lack of repair', and 'The most significant spots were the chamber, the outside of the gas tube extension in the upper receiver, and the inside of the carrier key'.

Dirty ammunition was also having an effect and the lack of a primary extractor action resulted in rifles failing to pull out the fired case. There was the widely reported—and accurate—account of the death of a gallant marine corporal who was killed while running up and down the firing line of his squad carrying their only cleaning rod and pushing out the jammed cases from his men's rifles during a brisk action.

The M16 scandal reached national proportions and resulted in a crash issue of proper cleaning equipment and hurried instruction in how to clean the rifle. After that there were no more jams. Today the rifle is virtually trouble-free. The British Army bought a few thousand M16s for the Borneo Confrontation and had no trouble with it at all, in fact it was well liked and the troops demanded more.

In spite of its failings in Vietnam the Armalite was adopted by the US Army in 1967 as a standard rifle. It was announced that it would replace the M14 as the standard infantry weapon in all parts of the world except for NATO service. This was a significant decision, since it meant that the US had virtually decided that the NATO 7.62mm round was out of date. Immediately there was a rush to buy and evaluate the M16. Other arms manufacturers began to build their own designs of weapon around the .223 ammunition. The M16, however, had cornered the effective market. It is still the leader and likely to remain so. Altogether, 55 countries have bought M16s for evaluation or for actual issue and use, a number that is only exceeded in modern times by the FN-designed FAL.

What is this remarkable gun like? Compared with the rifles of World War I and II, it is small. It measures just 39in and only weighs 6½lb—about the same as a double-barreled shot-gun. First impressions are usually not favorable. It looks both tinny and flashy and feels insubstantial to the touch. The plastic furniture has a 'toyshop look' and the lightweight and alloy metals heighten the similarity to a toy gun. The plastic fore-end is bulbous, so as to be thick

AMMUNITION COMPARISONS



*US .30 Model 1906 Velocity 2,750fps, 150 grains
For .30 M1 (Carand) and MG M1919A4*



*USSR/China 7.62mm x 54mm rimmed Velocity
2,800fps, 150 grains For M91 Mosin/Nagant Maxim*



*M16A1 service ammunition 5.56mm x 44.5mm
Velocity 3,250fps, 55 grains Tracer (red tip)*



M16A1 round, blank, grenade-launching, 8 crimps



M16A1 round, test, high pressure, M197



M16A1 round, dummy, Type 1

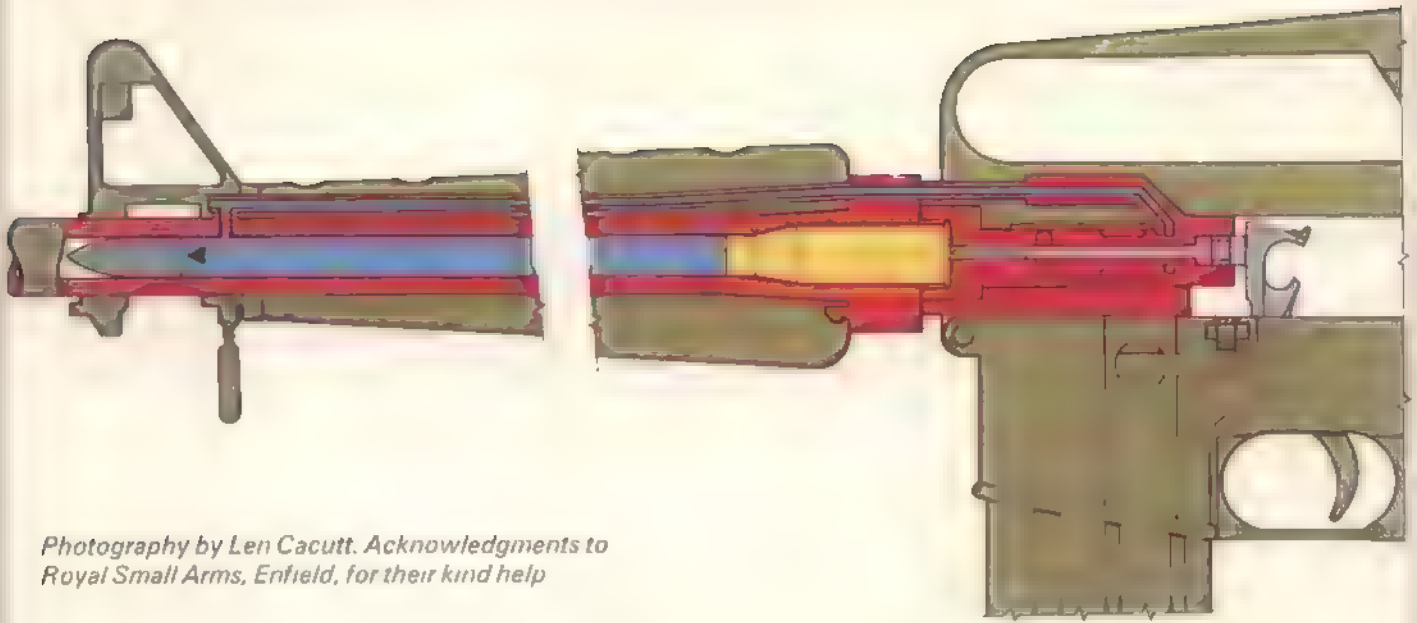
enough for a man's hand to grasp it easily, and it usually rattles a little as well. But this is no toy gun—as becomes very clear when firing. It is easy to hold and aim; the butt comes up and fits into the shoulder and the sights line up without effort. Lightness makes it easy to hold steady and the recoil is less than half that of a 7.62mm round. Anyone who has suffered the ordeal of firing a .303 for their recruit training will appreciate what an advance it is to have a rifle whose kick gives no trouble at all. There is noise enough, however. It gives a sharp crack, but it is not deafening. On automatic fire the muzzle climbs quickly and only the first shot of any burst goes near the target. But for quick, accurate single shots the AR15 has few rivals and despite criticism, the 55 grain bullet has plenty of punch at all normal ranges.

Each AR15 has a small knife bayonet, which is probably only of limited use on such a small rifle. One version of the gun has a 40mm grenade launcher, the M203, attached to the underside of the barrel. This makes it both clumsy and awkward to carry and fire, but it allows the rifleman to carry two weapons in one—both instantly ready for use. As well as the standard rifle there are now carbines of different barrel length and varieties of folding butt, but the basic rifle design is the most popular. A light machine-gun version of the rifle using a heavy barrel is available. So far, however, it has not appeared in any quantity.

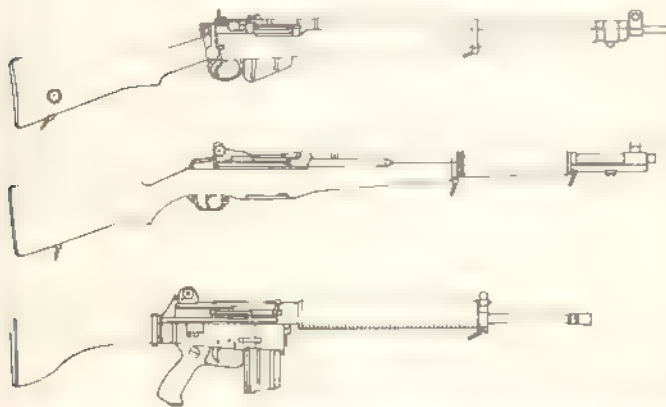
When Eugene Stoner left Armalite to go to Colt, the Armalite and Fairchild partnership also broke down. The Armalite company now designed yet another rifle—following another original train of thought. Many countries which would like to possess arms and more particularly to make their own lack the necessary sophisticated factories and plant to do it. Certainly only the modern manufacturing countries can hope to make the AR15. A good part of the world wide market was countries hard pressed for the money to buy these weapons, and equally short of the technology to make them. For these nations Armalite designed the AR18. This is a simple .223 calibre rifle of straightforward construction. The Company makes the



A Russian/Chinese contemporary of the M16. This AR as used by the Viet Cong is an Avtomat Kalashnikov variant AR56, made in China. It has been fitted with an ingenious folding bayonet, which can be folded back along the barrel. The AR56 has a calibre of 7.62.



Photography by Len Cacutt. Acknowledgments to Royal Small Arms, Enfield, for their kind help



△ The operating system of the M16 As the bullet moves down the barrel, some of the gases are channelled back through a stainless steel tube and into the bolt-carrier. This is forced back and given a twist to disengage the locking lugs from the barrel extension. The carrier then pulls the bolt back onto a spring, which supplies the energy for the bolt to operate the firing pin. Spent cases are withdrawn from the chamber by an extractor on the bolt, and are ejected through the opened dust-cover.

◁ Size comparisons between the British Lee-Enfield Rifle No 4 Mk 1, .303in (top); the US M1 (Garand) 30in (center) and the US Armalite AR18 223 (lower)

claim that the AR18 can be made from 14 stampings, 28 machined operations, three machined castings, six mouldings and four completely machined items, of which the barrel is one. All other parts of the rifle are commercial items available from stock. The metal is steel throughout and there are very few of the advanced techniques used in the AR15. Only a small production run is needed to repay the expense of setting up the line. There is no other rifle which can be made so easily.

Unlike the other Armalite designs the AR18 uses a short-stroke piston instead of direct-gas action. The piston is unusual in that it is a tube fitting over the cylinder. There are some holes in the piston sides. The gas comes back along the cylinder and pushes the tubular piston to the rear—imparting a sharp blow to the bolt as it does so. When the piston has moved a short way the holes are exposed to the gas and it is vented out into the hollow space inside the fore-end of the stock. Here it escapes. This unusual method of gas emission saves a lot of complicated manufacture. The bolt is locked and unlocked in the same way as the AR15. There is the usual change-lever for full and semi-automatic fire.

Although a little heavier than the AR15 (6lb 11oz) the AR18 is equally easy to fire and is by no means inferior in accuracy. True, it is a little square, and a trifle heavier, but it

handles well. Those who fire it like it. The US Army tested it and reported favorably, but they had plenty of AR15s on their hands and had no need of another design. Some production has started in the US and Japan—neither of them the countries for whom the design was intended.

So far the number of developing nations who have taken the design for manufacture is apparently very small indeed. The US production is mainly for a civilian sporting model known as the AR180 which is proving to be both practical and popular among American shooters, who use it for hunting medium-sized game. For this task the stock is slightly streamlined and the ability to fire full automatic is removed. A telescopic sight can be fitted and special mounts are included in the design to house it.

The Armalite company has shown that a small, dedicated team of imaginative designers can produce work every bit as good as that from a well-subsidized State Arsenal and can sell it in the face of opposition from disapproving officialdom and a complacent government. Armalite has also shown that the unusual can be just as successful as the commonplace, provided that it is sensibly applied. This one company—and its gifted designer Eugene Stoner—has brought off a revolution in the calibre and employment of military small arms in the Western World. The effects will be far-reaching.

John Weeks



Public Archives of Canada

LUNDY'S LANE

Niagara's thunder hid the sound of this no-quarter, no-holds-barred struggle for the possession of Canada

'Mightier armies have met in conflict, on fields of great renown, but a fiercer struggle in proportion to the numbers engaged, a severer trial of discipline, a greater test of patriotic bravery—a battle more closely associated with the beautiful in nature—the world has never known.' This was the verdict, a hundred years after, of Peter A. Porter, grandson of an American general who took part in the extraordinary battle of Lundy's Lane on 25 July 1814, fought within sight and sound of the Niagara Falls on the frontier of the US and Canada. In a six-hour night battle 4,500 US troops and 3,300 British-Canadians 'fought with a desperation bordering on madness'. They suffered a combined loss of nearly 2,000 men.

By the summer of 1814 time was running short for America in her war against Great Britain, begun two years before, ostensibly in defense of Free Trade and Seamen's Rights but with the real objective of annexing Canada. The downfall of Napoleon would allow Britain to devote all her energies and resources to guaranteeing the security of her North American provinces by striking such blows that

would force America to sue for peace.

Thinly populated and weakly defended, Canada was supposed to have been easy prey. Yet during 1812 and 1813 four inept invasions had been humiliatingly defeated by a handful of British regular troops enthusiastically supported by a largely French-speaking population and militia. The Americans expected to be welcomed by these people as liberators. Now there would only be time for one more attempt at conquest. Sixteen thousand troops, mostly veterans of the Duke of Wellington's Peninsular Army, were beginning to cross the Atlantic, bound for Canada.

As early as 28 February 1814 the US Secretary of War, John Armstrong, ordered the army at Sackets Harbor to cross the frozen Lake Ontario and capture Kingston, base of a British naval squadron and to cut off Upper Canada from the lower province along the St Lawrence river. Considering this impracticable, Major General Jacob J. Brown (an ex-New York militia general) marched his army to the Niagara frontier, having so misread his orders that he thought this to be the real plan and not the deception

Armstrong intended for the enemy's benefit. Only on 7 June did Armstrong get President James Madison's approval for another invasion across the Niagara river now the army was there.

Meanwhile, Brown's army underwent 10 weeks' intensive training at Buffalo on Lake Erie. Brigadier General 'Fuss and Feathers' Winfield S. Scott, at 27 the youngest US general, drilled the troops for seven to 10 hours a day. There was no official drill book, so Scott used the French *Ordonnance* of 1791. By mid-May he was reporting that the men 'would possess the firmness and cohesion of veterans.' Jacob Brown, a 39-year-old Quaker—formerly a county judge—lacked the necessary military expertise for the task. He had, however, already shown aggressive energy as a frontier farmer and smuggler.

Understrength—as usual

Secretary Armstrong intended Brown to have 8,000 men, but by the end of June only 2,800 regulars were 'present for duty' with 733 militia mustered. The army could expect 500 more militia and 600 Six Nations Indians from reservations on New York State. These were raised by militia Major General Peter B. Porter. This gave Brown two brigades of regular infantry (six battalions), four companies of artillery (12 guns), a squadron of US Dragoons and a volunteer militia brigade of three regiments, including 150 renegade Canadians. Across the 36-mile-long Niagara frontier the British were as usual understrength and underfed. Major-General Phineas Riall's 4,822-strong Right Division, weakened by malaria and dysentery, was widely scattered in a dozen fortified posts including four forts. This left Riall with a disposable field-force of only 1,700 men. A third of these were militia and Indians.

In July Brown was given the go-ahead 'to carry Fort Erie and beat up the enemy's quarters at Chippewa.' But he was to advance no farther than Buffalo at the neck of the Niagara peninsula—almost reached the previous year—and there 'await the arrival and cooperation of the Ontario fleet.' A 42-gun frigate, *USS Mohawk*, latest product of a frantic shipbuilders' race, was to give Commodore Isaac Chauncey's squadron a decisive margin of superiority over Sir James Lucas Yeo, who lifted an 18-day blockade of Sackets Harbor on 6 June. Once united with the US fleet, Brown's army would have the siege-guns to batter down Fort George, the main British Niagara position. Together they could go on to take Toronto and Kingston.

Brown crossed the mile-wide Niagara in a thick fog, at dawn on Sunday, 3 July. The two regular brigades crossed separately above and below Fort Erie, to encircle the garrison. They were out of range of the fort's three cannon, Brig. Gen. Scott was so keen to get ashore that he fell in the river while sounding for the bottom with his sword. Early that evening the 137-strong garrison of Fort Erie surrendered, on the very day an inspecting engineer reported it 'in a tolerable state of defence'. Half-open at the rear, it was in no condition to resist a siege. Only four American lives were lost. Next day, Scott's brigade marched 16 miles to Chippewa, skirmishing all the way with British light troops and Indians. Commanding officer of the British 100th Regiment the Marquis of Tweeddale explained away the American bravery as being due to the date—4 July. He was soon to regret his jibe. Maj.-Gen. Riall, a hot-tempered, 38-year-old Irishman from Tipperary, only waited for the barest sufficiency of reinforcements before attacking. Late afternoon, on 5 July, Riall led out 1,530 regulars, with 600 militia and

Indians, from his earthworks on the Chippewa river.

When he saw the grey uniforms of Scott's 1st Brigade, Riall was elated, 'Why, these are nothing but Buffalo militia!' He was not to know that clothing shortages, caused by the British naval blockade, had forced Scott to dress his men in militia grey instead of regular blue. Only when they 'deployed with the greatest regularity and opened a heavy fire,' did Riall realize that 'These are regulars, by God!' Ordered to charge, 850 redcoats of the Royal Scots (1st Regiment of Foot, oldest in the British Army) and 100th Regiment faltered at 60 paces in the face of a murderous cross-fire from 1,320 US regulars and six cannon. In Scott's words they 'mouldered away like a rope of sand' and retreated, leaving half their number on the field. The 100th lost 12 out of 16 officers including its CO, the Marquis of Tweedle, shot in the leg and thigh.

In less than an hour, Riall had lost 515 men and inflicted only 328 casualties on an army twice as strong. But though Chippewa was a famous and unique victory, Brown did little to exploit his advantage over the next three weeks. Riall retreated in good order to Fort George and fell back on 20-mile Creek to await reinforcements. The American army twice skirmished futilely outside the three forts at the mouth of the Niagara. Brown, expecting 24-pounder siege-guns from Sackets Harbor, wrote imploringly to Commodore Chauncey: 'We have between us the command of sufficient means to conquer Upper Canada within two months if there is prompt and zealous co-operation.' Chauncey, ill with fever, would do nothing until completely ready. Brown retreated to Chippewa.

Meanwhile the enemy had not been idle. Riall, reinforced, advanced to 10-mile Creek. His superior was the President of Upper Canada's Council and military commander of the province, 42-year-old Lieutenant-General George Gordon Drummond. He was born in Quebec and had 25 years British Army service behind him. He started for Fort Niagara from Toronto in the 187-ton brig *HMS Netley* on Sunday evening, 24 July. Drummond had already sent 520 troops to the fort in another brig and two schooners, lent by Commodore Yeo in marked contrast to Chauncey's unhelpfulness. A daring blow at Brown's communications was planned by Drummond from the British bridgehead in New York, Fort Niagara, while Riall followed the American retreat to St David's.

Stumbling into unexpected battle

Brown hoped to mislead the enemy by his retreat, rest the troops for two days, send off heavy baggage to Fort Schlosser, and march cross-country to Burlington. At midday on 25 July reports of a British force at Lewiston made him alarmed for Fort Schlosser. He decided to counter this threat by sending Scott's brigade on a reconnaissance towards Lundy's Lane and Queenston. Both commanding generals were stumbling into unexpected battle, for Drummond, learning of Riall's early morning occupation of Lundy's Lane and the further American retreat, decided to march straight there while the Lewiston force recrossed the 200-yard-wide Niagara to Queenston.

When Drummond arrived near the intersection of Lundy's Lane with the Queenston road, he was astonished to find Riall's 1,000-strong Light Brigade in full retreat before Scott's 1,800 advancing troops. Anxious to make use of the best defensive position south of Queenston, the 50ft flat-topped elongated hill or, rather, elevation at Lundy's Lane (highest point above Lake Ontario), and unwilling 'to baulk



the ardour of the troops', Drummond decided to stand and fight. It was just before sunset and Scott's columns were over halfway across a forest clearing, 600 yards south of the hill.

Within earshot of Niagara Falls, 1,800 British, Canadians and Indians deployed for battle on a sultry summer evening. Drummond planted his five cannon (two 24pdr light brass field guns, two brass 6pdrs and one 5.5in howitzer), with a small Royal Marine Artillery Congreve Rocket detachment, in the graveyard of a small, red-painted Presbyterian church. From here they could sweep the Queenston-Chippewa river road 100 yards away. Behind the guns stood three companies of Royal Scots (320 men)—the regiment in which Drummond began his soldiering—and the full 400-strong 2nd Battalion, 89th Foot, brought up at the double after a 14-mile march. This fine, mainly Irish, unit had defeated four times its number of US regulars in a classic 'thin red line' action at Crysler's Farm the November before.

The 70-man light company of the 41st Regiment extended the line to the Queenston road. Beyond it, the 300 forage-capped volunteers of the Incorporated Militia Battalion of Upper Canada lined field-fences to within 200 yards of the Niagara. They were supported by 120 men in a company of the 8th, or King's Regiment, which Drummond had once commanded for ten years. On the British right were the 350 green-jacketed Glengarry Light Infantry Fencibles with 200 Lincoln militia and a handful of Indians led by Cherokee-born Captain John Norton, alias *Teyoninhokarawen*, 'the Snipe'.

The impetuous Scott saw this imposing, slightly semi-circular array still forming-up, and advanced cautiously

conscious that all the American Indians had departed days before, unhappy with restraints on plundering and the lack of scalp bonuses. Nevertheless he decided to pin down the British before the main army's arrival. Major Thomas S. Jesup's 25th US Infantry was sent to outflank the enemy's left and gain the Queenston road, while the leading 1,200 infantry (three battalions) launched a frontal assault. This rapidly came to grief under the withering fire of the well-served British battery. Captain Nathan Towson's two 18-pounders were unable to silence this bombardment. The two center battalions were flung back before they reached the foot of the hill. Ninth Infantry on the left were so riddled by the pot-shots of the Glengarries and Indians, against whom their volley-firing was useless, that they fell back to the tree-line.

An hour after the main battle started, the stealthy US 25th caught the Incorporated Militia changing position. They took them in the flank with a volley and a charge from the woods, inflicting 100 casualties and forcing the battalion back over the road.⁴ The 8th's company had to follow suit and the 70 troopers of a 19th Light Dragoon squadron retired one-and-a-half miles up the road. Maj. Jesup's light company, under the aptly named Captain Daniel Ketchum, chalked up two more successes, taking prisoner one of Drummond's aides and Riall himself. The unlucky major-general, having as usual been in the thick of the fight, was being carried to the rear in the gathering darkness with a severe arm wound. His stretcher-bearers' witless cry of 'Make room there, men, for General Riall!' took the party straight into Ketchum's ranks.

Yet Jesup was too weak to exploit success. The rallied



"These are regulars, by God!" British Maj. Gen. Riall's reluctant tribute to the refashioned US army that defeated him in the battle of Chippewa on 5 July 1814. Here, Col. Hugh Brady's 22nd Infantry, hardest-hit unit at Lundy's Lane, keep an immaculate line under fire.

Canadians and an extended flank of the 89th lining the road drove him back to the woods. The American cheer for Riall's capture was countered by a British shout when one of Towson's ammunition caissons blew up, hit by a 6lb Congreve Rocket. His guns were silenced and Scott's battalions were losing renewed but unequal musketry exchanges with the British regulars on the hill. Some of the 22nd Infantry who 'were skulking from the fire' rallied with difficulty in the woods. At this stage, after an hour-and-a-half's combat, Drummond considered a counter-attack in the twilight using his largely unengaged right wing. The arrival of the rest of Brown's army, however, rapidly dissuaded him.

An awful stillness settled over the battlefield broken only by the ceaseless roar of the Falls and the artillery duel renewed by two fresh American batteries. Both sides were regrouping in the darkness. Brown had 2,500 more troops to deploy and Drummond, his regulars taking the militia's last cartridges, at last received the other half of Riall's command—1,200 tired and confused men from Colonel Hercules Scott's 1st Brigade. Having marched 21 miles since noon on a scorching day, they arrived three miles short of Lundy's Lane 15 minutes before the battle. Then Riall's order to retreat sent them four miles towards Queenston before Drummond's countermand arrived. The two

flank companies of the 104th (New Brunswick) Regiment (120 men) and five companies of the 8th (330 men) reinforced the right flank against Maj. Gen. Porter's newly-arrived riflemen, while the balance of Col. Scott's force was posted as a second line behind the Lane. Just as a gunner asked Capt. Norton whether the Yankees had given up for the night, the battle restarted.

Brigadier General Eleazar W. Ripley's 2nd Brigade replaced Winfield Scott's exhausted men in the firing-line. Brown determined to storm the hill and capture the destructive British guns. Four battalions were formed into line with another behind in close column of companies, a total of 1,400 men. Brown turned to Colonel James Miller of the right-hand 21st Infantry.

'Sir, can you take the battery?'

'I'll try, sir!'

At first it seemed that it would go the way of all previous frontal attacks. The 1st Infantry Regiment, the US Army's oldest, and just arrived from uneventful Mississippi garrison duty, disintegrated almost immediately having sustained only 33 casualties out of 250. The 23rd Infantry faltered after Major Daniel MacFarland fell mortally wounded at their head. Brig. Gen. Ripley took his place.

'The most desperate thing . . .'

Meanwhile Miller's 300 men silently advanced under cover of an orchard near the church. They could see the slow matches of the busy gunners glinting like fireflies in the night. The two-deep American line halted at a creeper-covered log-fence by the graveyard—not 20 yards from the British battery. Resting their muskets on the fence, they fired one tremendous volley and charged. Though totally surprised, the Royal Artillery men of 4th Battalion fought ferociously with rammers and handspikes and many were bayoneted while still trying to reload their guns. Seven officers of the 21st fell in the rush, but they took the cannon with 30 to 40 prisoners, some of whom were confined to the church but later escaped. One captured British officer called the charge 'the most desperate thing we ever saw or heard'.

It was the signal for the whole American army to advance onto the hill. The artillery came up at a gallop. One howitzer team galloped into the British line after all its drivers were shot down. Drummond struggled to organize an immediate counter-attack, but the infantry supports for his artillery had been thrown into confusion by the horse gun-teams careering back in panic. Now it was the British who would have to attack, up the even steeper north slope of the hill. The 103rd Foot and 300 militia with the two remaining 6pdr guns marched blindly right into the American center before taking crushing volleys and retiring in disarray. The night had no favorites. Scott, on the American right with Jesup's redeployed battalion, tried to launch an assault column to pierce and roll up the British line as it stood 60 paces away. Instead, Ripley's brigade fired into the column's left and rear totally foiling the attempt. Still, the British were thrown back, rallying round the colors of the 89th.

Thirty minutes later the redcoats came on again. The two 6-pdrs engaged the American guns muzzle to muzzle. Musket volleys, exchanged at 20 yards and less, lit up the night and even distinguished rival regimental buttons. Occasionally the moon glimmered through a gap in the clouds, but there was no wind to shift the thick acrid powder smoke. Clubbed muskets, bayonets and swords took over when ammunition failed. Those who could were firing and

loading as coolly 'as if it had been a sham battle.' Both sides heard orders for the other. False commands were shouted to misdirect and confuse opposing units. The indefatigable Drummond was everywhere urging 'Stick to them, my fine fellows!' An American officer retorted 'Level low and fire at their flashes.' Prisoners were taken simply because men blundered in the wrong direction. It was each soldier for himself in the blackness. Major Jacob Hindman had to spike two of the American cannon because the British got too close.

The battered remainder of Scott's brigade squeezed into a narrow lane south of the hill. After the second British repulse, Scott organized his skeleton regiments into columns of attack ranged in echelon. He led them over the hill and down the other side. Drummond, now minus his horse, hid the battleworthy remnants of the 89th by kneeling them in a field of grain. Exercising superb fire-control, he withheld their volley until the Americans got within 20 paces, 'the effect of that single fire on the enemy's ranks was awful in the extreme.' After the bayonet charge that followed it up, Scott's men could take no more, the 11th and 22nd, out of ammunition, went to pieces. Lieutenant F. A. Sawyer of the 11th had one man left in his platoon and took command of one of the two Major Henry Leavenworth salvaged from his 9th Regiment. The brigade now numbered fewer than 200 men fit to fight.

Bruised by cannon ball

Scott still drove them forward again, but a 1oz musket ball fractured his shoulder joint after two horses had died under him and a ricochet cannon ball had bruised him. The 6ft 5in Virginian was laid out beneath a tree, feet first, facing the enemy. Brown himself, severely grazed by a Congreve Rocket stick, was faint with loss of blood from a flesh wound in the thigh. An aide encouraged him: 'Never mind, my dear general, you are winning the greatest battle ever gained for your country!' Nonetheless Brown, carried from the field, ordered a retreat before midnight, even after Ripley and Porter drove back a third British onslaught. Drummond, refusing treatment for a serious neck wound, set about making a fourth attempt. Ripley, with but 1,500 fighting men under orders, struggled to make an orderly three-mile retreat towards camp. As many guns as could be horsed up were brought off. The gunners limbered up a British 6pdr while somehow the enemy hitched up theirs.

The final triumphant British advance, spearheaded by the 41st's veteran light company, interrupted these arrangements. A voice tried the old trick of a bogus order to the 41st. 'Our bugle then sounded for the company to drop. A volley was then fired upon us which killed two corporals and wounded a sergeant and several of the men. The company then arose, fired and charged,' remembered Private Shadrach Byfield. All but two of the US 6-pdr crew were shot down at their gun. This fell into the 41st's hands along with several ammunition tumbrils. Four out of the five lost British cannon were recovered only 100 yards from their original position. At midnight firing ceased with the red-coats once more in possession of their hill.

The armies had fought each other to a standstill, but only a few hours sleep on chilly ground was possible before sunrise. The plight of the thirst-crazed wounded, with the great waterfall so near yet unreachable, was terrible. Brown ordered Ripley to occupy the hill and retake the guns next morning. It was sheer folly. Ripley mustered 1,800 men and went out to collect more wounded but discovered Drum-



J Ross Robertson Collection Metropolitan Toronto Central Library

mond's army more than a mile in advance of Lundy's Lane. A surgeon found the dead three deep in and about the battery position with 60 to 70 horses lying dead around it. Neither side was anxious to renew the slaughter, but at noon Ripley began a somewhat precipitate retreat. Tents and rations were thrown into the Niagara to make room in the wagons for wounded. A warehouse and mill were burnt at Chippewa and the bridge broken down. By midnight the whole army was back where it started three weeks before—Fort Erie.

The British were in no state for an all-out pursuit. Indeed a week passed before the whole army moved forward, but dragoons, light troops and Indians followed the US line of march picking up the odd straggler and corpses fallen out of the wagons. Back on the hill the gruesome work of clearing up began. The 200 American dead left behind had to be burnt. One impatient loot-seeking Indian even tried to throw a living American onto the fire, he was shot and ended up in the blaze himself. The wounded were scarcely better off, though many could be evacuated by water. At Fort Niagara, the 22-year-old surgeon of the 89th, Dr William Dunlop, had 220 to tend in a tumble-down, fly-

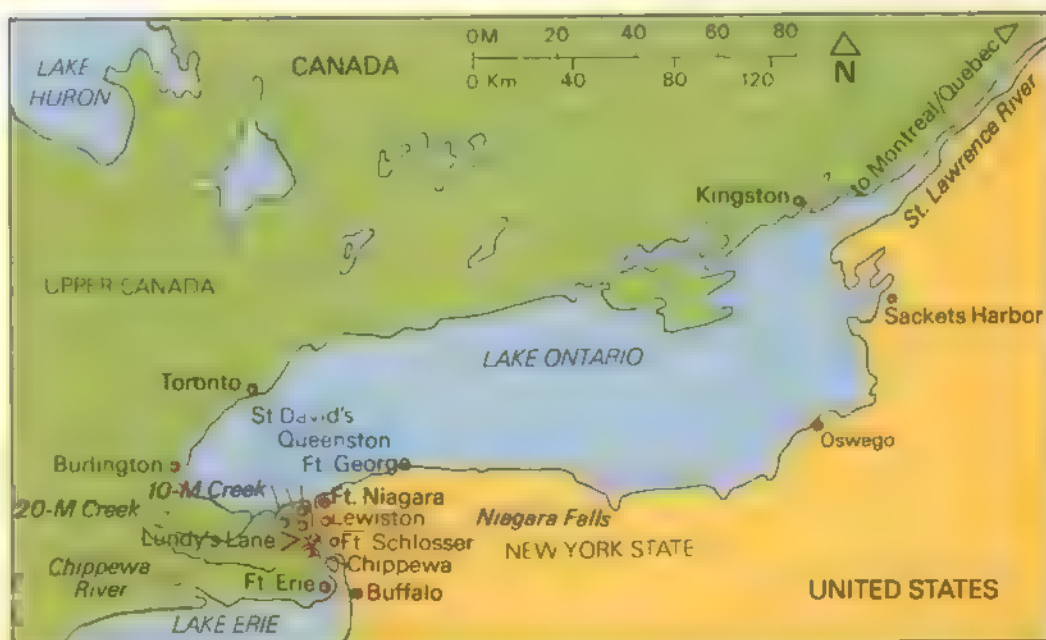


British and American Historical Museum

◁ Gen. Drummond 1771-1854. 'Zeal, intelligence and local knowledge' chose him for the arduous command in Canada. A lieutenant-colonel in five years, he led a regiment at 22, was a general at 33

^ An unreal vision of Lundy's Lane shows the US advance against fictitious Scottish Highlanders probably confused with Glengarry It troops actually present. Gen Jacob Brown lies wounded

▷ Upper Canada 1814. Drummond raided Oswego in May, part of the struggle for the lakes which really dictated the War of 1812's intensest fighting in the Niagara peninsula.



Davis Harrison V.P. Ltd



◁◁ A private of the 21st US Infantry Regiment
 ◁ Private in a battalion company (red and white plume) of 2nd Batt. (1804-16), 89th Regiment of Foot (later Royal Irish Fusiliers). The shako hats look similar, but the 1813 US model is of more durable leather instead of felt in the 1812 British 'Waterloo' type, otherwise it is a copy. The US weapon is a .69in Springfield smoothbore musket on the French 1777 pattern. The redcoat's musket is a 1797 India pattern .75in calibre 'Brown Bess' for which he carries 60 1oz bullets. The US load is 44 lighter ones. At Lundy's Lane, shooting up to two volleys a minute, British infantry exhausted ammunition half-way through the battle. They borrowed the militia's last cartridges. Fortunately 'Brown Bess' carried an 18in bayonet as against the 16in US version. The 89th Foot (black regimental facings) earned the battle honor of 'Niagara' for its fine record during 1813-14. The 21st US Infantry CO's 'I'll try, Sir!' is the motto of today's 5th US Infantry whose regt. crest bears the British cannon brilliantly taken by Massachusetts' recruited 21st

ridden log barracks. He worked nonstop for 96 hours with one orderly's help before taking five hours sleep. Yet such was the incredible toughness of these men that one Glengarry lieutenant, with five wounds reported mortal, survived the night and carried one bullet in him for life.

The statistics of all this bloodshed are not certain. Drummond reported a loss of 878; 84 killed, 559 wounded, 193 missing and 42 seen taken prisoner (the US claim was 169). The 2,200 redcoat infantry had borne the brunt with 614 casualties; of which the 89th contributed 254 or 63 per cent of its strength, including 17 officers, 14 sergeants and six drummers. The Royal Scots loss of 172 was over a quarter of their total for the entire war. The 800-odd militia bore their share with 165 men lost. Well over a third of the men engaged from the outset were put *hors de combat*. The full butcher's bill represented about 27 per cent of Drummond's some 3,300 combatants. The 110 officers and NCOs in the casualty list paid the price for the superb discipline and control they exercised during a confusing night battle. Many wounds, however, were only from buck-

shot. It was US practice to ram three down on top of each musket ball.

On the American side, deductions are less certain. Brown did not make an official return until 7 August. By this time it was in his interest to do some favorable arithmetic. He gave a figure of 854 (171 killed, 573 wounded and 110 missing), surprising since he did most of the attacking, but he left out two units which had detachments engaged. Col. Miller gave 126, not 104, as his 21st's loss. In one company of the 23rd only nine out of 45 responded to the morning roll-call. Many stragglers rejoined days later, but Drummond claims 'several hundreds of prisoners' in his estimated enemy loss of 1,500. Perhaps the comparison of junior leader (lieutenant and sergeant) casualties (97 US: 85 British) provides some clue as to the true ratio. If the British loss, counting Indians, exceeded 900, then the US cost must have approached 1,100.

What was the significance of this bloody battle which 'The Times' deemed 'equally glorious and important'? Certainly the sequel was demoralizing for the victors. To the

Lundy's Lane lasted for six hours of mounting confusion. These timings for it are highly speculative 1800hrs. Hurried British deployment on the hill and behind an RA battery whose main firepower comes from two 24pdr lt. brass field guns. These cannon, from Ft. George, unusually heavy, were of immense benefit to the more tired defenders

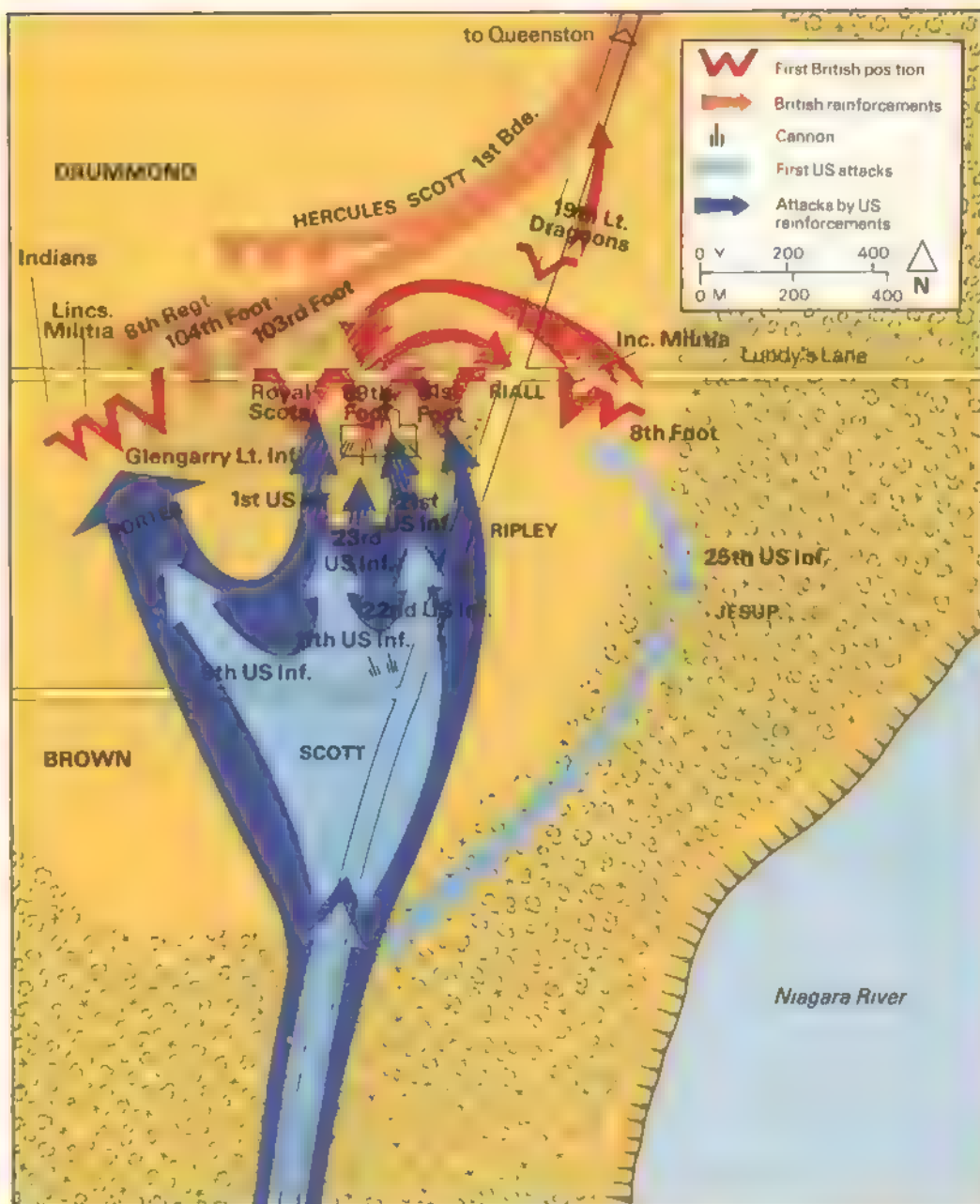
1830. US frontal attack by 1st Brigade and two guns
1930 Jesup's Connecticut-recruited 25th Regt. swings round the British left flank to rout the Inc. Militia A redeployment of five 89th Foot coys. keeps Jesup off the Queenston Road
2000. Winfield Scott's second frontal push fails before the remainder of the US army has come up
Hercules Scott joins the British in a pause

2100. Mass US attack takes the British guns and hill.

2130-2330. Drummond counter-attacks four times.

The fourth British onset coincides with US retreat. Drummond's 'Niagara Falls' dispatch recorded that 'the steadiness and intrepidity displayed by the troops... were never surpassed.'

Jacob Brown: 'The battle... will find but few parallels. More desperate fighting has rarely been known.'



end of his days Winfield Scott would deny the British that description, insisting that only Ripley's withdrawal marred a US triumph. Drummond besieged a much-strengthened US-held Fort Erie for six frustrating weeks with a lengthening sick list from torrential autumn rains. He lost more men that he could afford in a singularly costly night storming attempt and a sortie by Brown. Only reinforcements of Wellington's veterans, which some American writers liked to involve prematurely at Lundy's Lane, enabled him to continue the siege

Meanwhile Chauncey's fleet belatedly ranged Lake Ontario, making the British supply position so difficult that Drummond retired to Chippewa. For a fortnight in October, behind unassailable defenses ready for an alerting rocket signal from Lundy's Lane, he confronted an American army twice his strength. Thwarted by the British lines and oncoming winter, Major General George D. Izard withdrew his 6,300 troops across the Niagara, blowing up Fort Erie on 5 November. After mortifying setbacks, Drummond had finally won the campaign thanks to Lundy's Lane and Yeo's

fleet. Headed by the newly completed 112-gun *St Lawrence*, whose mere launching sent Chauncey scuttling into port, the fleet blockaded Sackets Harbor. Exercising permanent command of the lake from mid-September, it brought the army vital reinforcements and supplies just as half the squadron had done, so crucially, prior to Lundy's Lane

The battle alone did not, as some patriotic Canadians liked to think, preserve Canada's independence, but it took the cutting-edge off Brown's aggressive remodelled army. And it bought precious time in what proved to be the last campaigning season before peace was signed. If Brown had won and met up with Chauncey, who actually sailed on 1 August, the Niagara forts, Burlington and Toronto, were his for the taking if not Kingston itself. By October most of Upper Canada would have been in United States hands with awesome implications for peace because the British would simply have lacked time to reconquer the whole province in 1814. In that sense Lundy's Lane did preserve Canada's 'heritage with forceful blow.'

Randal Gray



Fox Photos

BOMB DISPOSAL

'There are old bomb disposal experts and bold bomb disposal experts: there are no old and bold bomb disposal experts'

Not all acts of personal bravery in war are carried out in the heat of battle. The work of the bomb disposal squad requires a coldly calculated form of self-sacrifice. Throughout World War II, bomb disposal techniques became more and more sophisticated to counter the increasing ingenuity shown by the designers of bombs and mines. But technical advance would have been to no avail without the men with the courage to apply it

When war broke out in 1939, the combatants were organized according to their own ideas on the needs of contemporary warfare. Very quickly, however, it was found that a number of formations and units previously unknown would have to be established to cope with a variety of new problems. This was the first war where aerial bombardment on a large scale was expected and one of the problem areas was the question of how to cope with bombs dropped by the enemy and which had failed to explode. Most bombs dropped from an aircraft are designed to detonate as soon as they hit the ground. But things do not always go as planned

A bomb fuze—or the fuze of any explosive ordnance—is a delicate compromise between safety and efficiency. It has

to be sensitive enough to work when given the correct stimulus—as, for example, hitting a building. On the other hand it must be absolutely safe while the bomb is in store, being fitted to the aircraft and being flown to the target. It should only be armed—brought to a state of readiness to explode—after it has left the bomb rack and is well clear of the aircraft. As a result of this technical compromise it is not uncommon for bombs to fail to arm, fall to the ground and lie there without detonating, with large quantities of high explosive within all in working order and ready to be set off

It might be assumed that if dropping from several thousand feet did not cause the fuze to operate, then it would be quite in order to go along, pick up the unexploded bomb, heave it onto the back of a truck, and drive off with it to somewhere safe where it could be exploded harmlessly. But unexploded bombs do not behave so sensibly. The fuze may well have failed to work after a drop from 10,000ft, but it may equally well function most decisively on sensing the footsteps of an unsuspecting passer-by.

Consequently there grew up, both in Britain and Germany, organizations whose total brief was to render these un-

A 1,200lb German bomb being hauled from the grounds of the German Hospital, London, on 25 November 1941. It was made safe by Lt. R. Davies, CO of a BDU which was responsible for saving St Paul's Cathedral after a bomb landed near without exploding.

exploded bombs harmless, remove them to some safe spot, examine them to see what the other side were using and if they had any good ideas on design, and finally to get rid of the bomb in one way or another. It was a job which called for courage of a very special kind. It is one thing to rush, yelling, into a bayonet charge with all your comrades alongside you, but it is a very different brand of bravery which keeps a man walking as he approaches half a ton of highly irresponsible and nervous explosive. And the job is still not yet over. Besides terrorist devices, the quantity of munitions thrown, fired and dropped during 1939-45 was so enormous that bomb disposal units still have a full time job today. In the London area and surrounding counties of England well over two thousand pieces of wartime ammunition are found and made safe every year.

The first weapon to present this kind of problem was the mine, and so the British Royal Navy became involved in mine disposal at an early stage of World War II. It was not so much that mines failed to explode, but that they did so with distressing efficiency. In the first few months of the war there was a series of sinkings of coastal vessels in waters believed to be free of mines. The *Luftwaffe*, it was discovered, had devised a technique of laying mines by night from aircraft. But how had the floating victims triggered off the mines?

The layman's idea of a sea mine is a round ball with spikes. The spikes incorporate a sensitive switch, and the mine is detonated when a ship bumps into one. But there are a number of other ways of making mines function—particularly in shallow water. Anyone who has watched a canal boat passing along a narrow canal will have seen the differences in the water level at the sides of the canal and in the middle, due to the displacement of water by the boat. This displacement causes a rise in pressure on the bottom of the channel. Such a rise can be detected by a suitable mechanism and used to detonate a mine beneath the ship. If the mine contains several hundred pounds of HE, it can break the back of a small coasting vessel.

Some mines are designed to react to the noise of the ship. To the casual observer on the shore a ship seems to pass by quite silently. A few minutes in the engine room of a coasting vessel will give the lie to this idea. The thump of the engines and the rhythmic throb of the screw generate a distinctive sound. This is transmitted through water for a considerable distance, and can be detected and used to trigger a mine.

Then there is the magnetic field of the ship. As most schoolboy experimenters know, if a piece of iron is held in a certain relationship with the earth's axis and is then struck smartly with a hammer, it can be magnetized. In the same way, when a ship is being built the cumulative effect of all the hammering and riveting builds a magnetic field into the ironwork. The strength and polarity of the field depends on the direction the ship lay while it was being built. Some experts can tell which direction the ship was pointing when under construction and sometimes even where it was built, simply by examination of the magnetic field it possesses. Wherever the ship goes, the magnetic field goes too—like

an invisible presence. A simple electronic detector in a mine will react to the field and detonate the mine.

This idea had been experimented with by the British during the World War I. So when the mysterious sinkings began the Royal Navy soon realized that a magnetic mine was probably responsible. But there were a number of different ways in which a magnetic mine can be made to work. In order to counteract them it was necessary to find out how the Germans were operating their particular pattern. This meant laying hands on a German mine in working order. While people were still wondering how to manage this, fate played into their hands. A German mine-laying plane misjudged its position and dropped a mine into a few inches of water off the Essex coast. As luck would have it, the mine landed on the stretch of sands forming the firing area of the Army's Experimental Establishment at Shoeburyness, Essex.

This is probably the most minutely surveyed and plotted stretch of sand in the world. An alert sentry saw the mine go down. Its position was rapidly fixed by the range instrumentation squad. Being an experimental range, the occupants appreciated the value of this gift from the sky. They telephoned the Naval Mining School at once.

Next day the mine expert was on the spot. He depended on the fact that since the mine had not dropped into deep water the fuzing system would not have armed properly and it would be—possibly—safe to try to examine it. The story of Lieutenant Commander Ouvry's lonely walk out to the mine, his dismantling of it and how its secrets were learned, and the well-deserved award he received, have been often told. There were two results of his labor. The first was that the Royal Navy, with the German circuitry laid bare before them, could devise a counter-measure. By coiling heavy copper cable around ships and charging it electrically they could nullify the magnetic signature of the ship so that it no longer triggered the mine. The second result was less happy. Realizing what had happened, the Germans began to take steps to prevent the trick being repeated on any new design they produced.

Some months after the magnetic mine had been outwitted by the British, a new type of German mine was found in shallow water off the south coast of England. It was, apparently, a variant of the magnetic mine. After being made safe in the normal way by removing the externally accessible detonators, it was taken to the mine experimental base to be opened up to check on any new circuitry the Germans had devised. As it was opened it blew up, killing the researchers. Numerous suggestions were offered, but the cause of the detonation remained a mystery.

Later, another mine of the same pattern was recovered. This time one volunteer entered the store shed where the mine had been placed, with the intention of opening it up—in the full knowledge of what had happened last time someone tried to probe into this type of mine. But the volunteer was lucky. A circuit defect had put the booby-trap mechanism out of action. The secret was laid bare; the designers had fitted a photo-electric cell in the mine-firing arrangements. Nothing happened while the mine was closed and the interior was dark. But as soon as the mine inspection plates were removed, letting in light, the cell reacted and fired the mine.

This began a long battle of wits between designers and booby-trap 'unravellers' which carried on throughout the war. When the *Luftwaffe* began bombing Britain, several of their bombs failed to explode. In many cases this was a simple matter of the fuze failing to operate. But it was often



Keystone R H L

Imperial War Museum

deliberate. The bomb, fitted with a clockwork or electrical timing device, would lie undiscovered and detonate when the area had resumed normal activities.

The problem facing the disposal units was first to find such bombs, then to make them harmless and finally to take them away and dispose of them. Finding them was not easy. Even today, excavations for building operations bring to light bombs which had been lying there for more than thirty years. These are cases of fuze failure, since nobody has yet devised a reliable timing device operating over a period of years. Air raid wardens and police soon became adept at counting bombs dropped, often noting the absence of rhythm as a stick of bombs fell with one dud in it or hearing the dull thud as a bomb landed without exploding. Careful inspection of bombed areas in daylight often revealed the holes where such bombs had driven into the earth. Sometimes the bomb was deflected by a house roof and was lying in the open.

Once found, an unexploded bomb had to be dealt with. There was no knowing whether it was a faulty fuze or had a deliberate delayed-action device. All bombs were considered dangerous and given the full treatment. There are old bomb-disposal experts, and there are bold bomb-disposal experts, but there are no old and bold bomb-disposal experts.

Giving the bomb the full treatment could be difficult if it had buried itself 10 or 15ft down into the soil. It had to be dug for—and very gently lest the impact of a shovel should upset the fuze. In many places where the ground was low-lying and wet, the water had to be pumped away as the squad dug. Special 'de-watering apparatus' was developed to drain the water from the surrounding earth. Often bombs did strange things after entering the earth, being deflected by stones or hard patches and boring off at unexpected angles. This created problems for the digging squad. In some cases, where the ground was soft, the bomb continued to

work its way down into the ground almost as fast as the digging squad were pursuing it. Another, and hazardous, problem was the bomb which bored deep into soft ground and there exploded. The only outward sign would be the usual small entry hole, since the force of the detonation would have expended itself in making an underground chamber, or 'camouflet', in the soft sub-soil. As a result the squad digging for the bomb would suddenly break through into an underground cavern filled with poisonous fumes from the explosion. Unless breathing apparatus and ropes were at hand the diggers could fall into the camouflet and be suffocated before they could be rescued.

Once the unexploded bomb had been uncovered, it had to be made safe enough to be moved. The disposal expert first removed all metal objects from his person—just in case the bomb used a magnetic detector. He then came close up to the bomb and listened. If it was ticking, there was a timing device in operation. Should nothing be heard, then a timing device might be absent, or might be stopped, permanently or temporarily. (It was common for the ticking to suddenly start while the expert was at work on the bomb. This was the signal to down tools and retire immediately, since it usually ticked for a few seconds and then exploded.)

The next step was to gently clean away all the soil adhering to the bomb, in order to see the fuze plate. Often, the markings on it would indicate what sort of fuze it was and thus guide the disposer in his next steps. However, just because the markings indicated a simple impact fuze, it did not necessarily mean that there were not other devices built in as well. A close examination of the whole bomb, or as much of it as could be seen, would be made to see if it displayed any unusual features. If the fuze was underneath the bomb, then it had to be reached by rolling the bomb over. This task required long ropes, gentle pulling and patience. After rolling it over it was left alone until it was discovered whether or not the movement had started some-



Vickers Ltd

◁◁ A German 1,600lb Hexamine landmine uncovered in N. London in 1969. Steam was injected at pressure through a drilled hole to melt the explosive.

◁ This 4,000lb, 18ft-long bomb fell on Croydon early in World War II. It was not discovered until December 1945.

△ An early mark Vickers Wellington bomber fitted with an anti-magnetic-mine ring. A current flowed through the ring causing disturbance to the local magnetic field and detonating the mine

▷ The secrets of the German magnetic mine uncovered The mine after Lt. Cdr. Ouvry's brave investigation on Shoeburyness Sands at midnight, 22 November 1939.



Imperial War Museum

thing happening inside

Next, a microphone was clamped to the bomb and a cable run to an amplifier, where a listening watch was kept at a safe distance while the expert worked. He could not devote his mind to what he was doing if he had to keep one ear open for the ticking which heralded detonation, so the amplifier man did the listening for him, calling a warning if the bomb made any untoward noises

If the bomb was of a standard pattern armed with the normal fuze, the next move was relatively simple—the fuze was unscrewed and removed. This was a risky business. Some very simple mechanical booby-traps could be fitted under the fuze to detonate the bomb as soon as anybody tried to withdraw the fuze from its seating. Originally, removal was carried out by hand with simple tools, but when the anti-withdrawal devices were discovered, a remote-controlled unscrewing machine was invented. This was clamped to the body of the bomb and engaged with the lugs on the fuze. Then, from a safe distance, compressed air was applied to turn the spanner and withdraw the fuze.

With the fuze removed the pocket beneath was emptied of the 'exploder charge' of pellets of explosive. When this was done the bomb was, as far as one fuze was concerned, harmless, but it was still closely examined to make sure that no further fuzes existed. Because of the effort, time and expense involved in delivering bombs from Germany it was worthwhile ensuring efficiency by fitting bombs with two or more fuzes. If more fuzes were found, they were dealt with, and the bomb finally certified as harmless. It could then be hauled out of its hole and removed, either to be dismantled by experts in order to find out what the latest design techniques were, or to be taken to some desolate spot and blown up.

A timing device in the bomb would make things more difficult. In the early days the disposal expert simply trusted to luck and got to work with spanners or the pneumatic

unscrewers to try to remove the clock as gently as possible—hoping that it would not start ticking while he was at work. Then came the first of many clock-stopping devices. It was well known that if you worked near a powerful magnet while wearing a wrist-watch, it would generally be stopped by the magnetic field. An extremely powerful electromagnet was produced which could be clamped on to the bomb. Its powerful magnetic field could completely jam the works of any clock. Once jammed, it could be removed quite safely. Predictably, the fuze designers soon adopted non-magnetic metals. This was countered by directing a stream of carbon dioxide onto the clock and freezing it solid. Another method was to drill a small hole and inject a quick-setting plastic compound into the mechanism to jam everything

The next German move was to produce an 'anti-disturbance' fuze. This looked, from the outside, exactly the same as the standard impact fuze. The German standard bomb fuze was not mechanical, but electric—an ingenious design produced by the Rheinmetall company in 1937. It was a plain aluminium cylinder with two electric contact pins on the exterior cap. When the bomb was installed in the aircraft, a charging head was clamped onto these pins, which depressed them to connect with the electric circuits inside. As the bomb was released from the aircraft, a switch closed and, when the bomb was about a foot beneath the bomb-racks, a current was rapidly injected into the fuze before the charging head was pulled clear. This current charged up a series of condensers inside the fuze. While the bomb was falling, these discharged through a resistor circuit and charged a firing condenser. When the bomb struck the ground, the impact caused a sensitive switch to close, allowing the firing condenser to discharge into a detonator and detonate the bomb. By altering the values of the electrical components it was possible to delay the charging of the firing condenser until after the bomb had landed. The

impact switch would close without effect and then open again. The firing condenser was fully charged. Any movement of the bomb would affect the sensitive switch, close to the circuit and fire the bomb.

The response to this was to make up a plug of similar form to the German charging head. When the bomb was discovered, it was plugged into the fuze to drain off the current in the condensers—making the fuze useless. Once this move was perfected, the opposition made another change and re-designed the interior of the fuze so that if any connection was made to the contact pins after the fuze was charged, it would short-circuit the whole system and fire the detonator instantly.

British devices relied less on electrical gadgetry than on simple mechanical or chemical devices. These were hard to counter by such things as magnetic stoppers or freezers. Most of the Allied devices developed during the war have never been revealed. It is known, however, that one RAF fuze relied on the slow stretching to breaking-point of a wire made of the purest lead—a mechanism extremely difficult to counter. A favorite gambit of the RAF was to scatter 8lb bombs, fitted with anti-disturbance fuzes, across German airfields. This posed a considerable problem in clearance. These bombs were fitted with fuzes of differing delay. Until they were cleared completely the airfield was virtually unusable.

Mine-minded Germans

A less well known but equally hazardous job was that of clearing enemy mines and booby-traps on the battlefield. The Germans were very mine-minded, and they produced a wide variety of ingenious designs. The Tellermine was their standard anti-tank mine. It carried a charge of 11lb of TNT and needed a pressure of about 500lb to fire it, and it could deal very effectively with any tank unfortunate enough to drive across it. Once discovered, either by using an electronic detector or, more often, by crawling slowly over the ground prodding with a bayonet, the T-Mine fuze could be easily made safe by inserting a length of wire into the striker to lock it. The mine could then be pulled out of its hole.

However, the designer of the mine had enough foresight to fit two additional fuze sockets—one on the side and one underneath the mine—into which booby-trap igniters could be screwed. These were simple 'pull switches' with a short length of cord attached, anchored to a peg in the ground. If an unwary mine-lifter merely disarmed the normal pressure fuze on top of the mine and then tried to lift it from the ground, these cords would trip the pull switches and fire the mine.

It did not take the British soldier long to discover this trick—so he carefully felt around the mine edges before lifting it. Then he lifted it an inch and felt beneath. If there were no cords, out it came. Soon a more sophisticated anti-handling device appeared. A special anti-lifting mechanism was produced for the Tellermine. This was a charge of explosive with a simple striker mechanism which was placed in the ground before the mine. The weight of the mine stopped the striker from firing the charge. Any attempt to raise the mine by even an inch, however, allowed the striker to fire. The answer to this device was to attach a length of wire to the mine handle, retire to a safe distance, take cover, and pull. This operation was made hazardous by the German habit of putting anti-personnel mines in any likely looking ditch or fold of ground into which the mine-puller was likely to jump for cover.

With the gradual but steady improvement of the system of electronic detection first used by the Polish Army and later adopted by the British and Americans, the German designers turned to the development of mines which could defy detection. Earthenware, glass, plastic and papier-mache were all used for mine casings. The Germans also trained dogs to detect mines by scent; the Americans made some experiments along these lines too, but they were not particularly reliable.

Allied troops in Normandy in the hot summer of 1944 discovered that the rabbit was a better detector than any other animal. Apparently, when the creature stepped out of its warren to answer the call of nature, it liked a warm spot. The heat reflected from a buried mine was most acceptable. So a gentle prod with a bayonet under any rabbit droppings would usually unearth a German mine. It made science look ridiculous.

Ian Hogg

British delayed-action fuse 37 with anti-withdrawal device

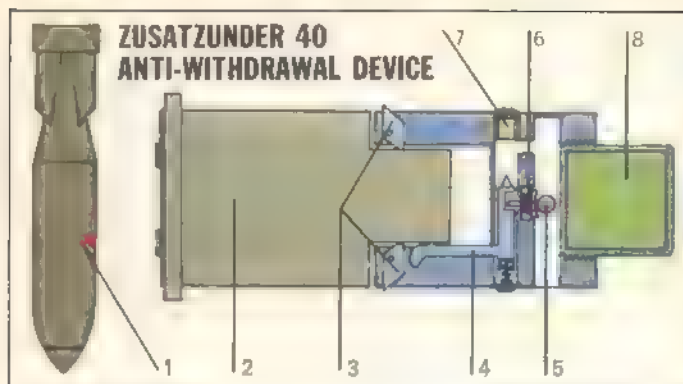
Official reports state that 2.45 million tons of bombs were dropped on Germany during World War II. That tonnage included many bombs fitted with the delayed-action Fuse 37. These bombs are still being found.

Fuse 37 has a double action. Primarily it had a chemically operated, delayed action, variable from two to 144 hours. The time-elapse setting was dependent upon the thickness of a celluloid disc and the strength of acetone held in a glass ampoule. Secondly, the bomb could be fitted with a device which detonated it when the fuse was withdrawn during an attempt at de-fusing.

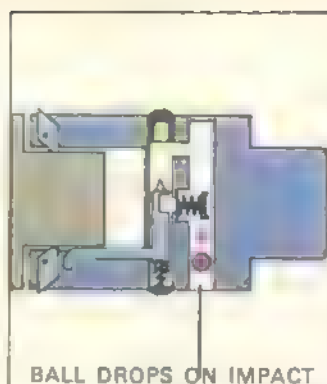
The delayed mechanism was activated by a spindle. As this was screwed down by the action of a small propeller in the tail of the bomb, it broke an acetone-filled ampoule.

The released acetone immediately began to dissolve a celluloid disc which held in place a spring-loaded striker-pin. The acetone was dissolved evenly by a cotton-wool plug, making its action smooth even if the bomb was upside-down. When the melting action had sufficiently weakened the celluloid, the striker-pin was forced through the celluloid by the spring, striking the detonator and exploding the bomb. Cold weather tended to make the time-delay longer, warm weather had the opposite effect. When the bomb struck, the fuse was sometimes damaged, even the celluloid might be hardened by the impact. These mishaps tended to delay detonation for an indefinite period. But if the celluloid was weak, it took only the slightest jolt to cause the bomb to explode.

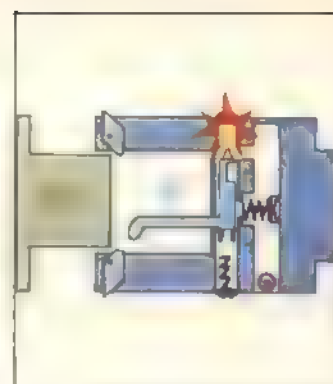
The anti-withdrawal device came into action if the fuse was unscrewed by bomb-disposal squads. Small steel balls were held in place between the cap nut and the striker housing, keeping the striker-pin spring under tension. Any attempt to unscrew the fuse resulted in an increase in the gap between the cap buffer and the striker pin. The steel balls fell to one side and, impelled by the spring, the striker-pin went home, detonating the bomb. This anti-withdrawal device bypassed the time-fuse system, exploding the bomb even if the delayed action system was damaged.



Who copied who? This German electric fuse has an anti-withdrawal device based on the same basic system as the British fuse 37. Any attempt to unscrew or pull the fuse causes detonation.



BALL DROPS ON IMPACT

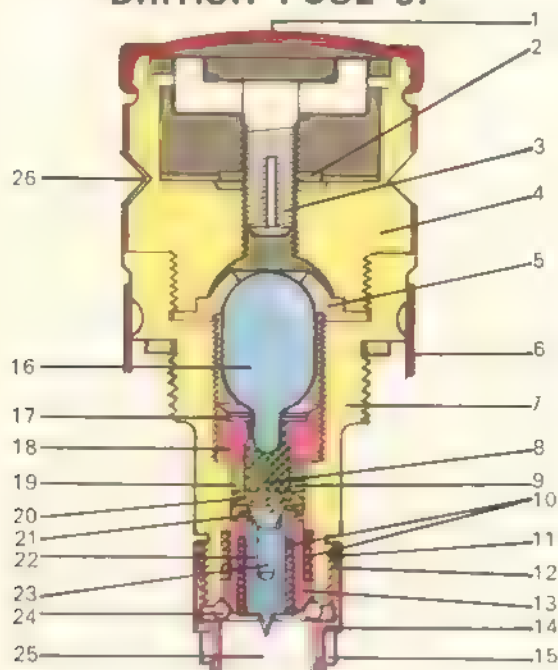


Peter Sarson Tony Bryan

- 1 Fuse position
- 2 Standard electric fuse
- 3 Knives
- 4 Release arm

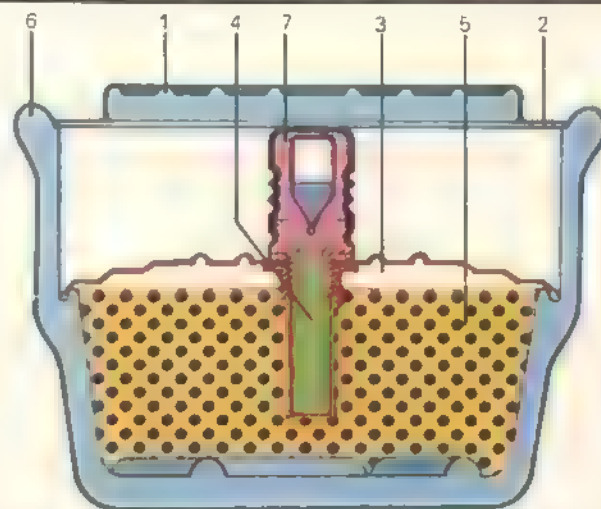
- 5 Steel ball
- 6 Safety pin
- 7 Detonator
- 8 Explosive (TNT)

BRITISH FUSE 37



- 1 Protective cap, removed when the fuse was inserted
- 2 Rubber gasket
- 3 Spindle
- 4 Spindle container
- 5 Rubber buffer
- 6 Fuse cavity liner
- 7 Body of the fuse
- 8 Cotton-wool plug
- 9 Intermediate ring
- 10 Spring for striker-pin, and striker-pin housing
- 11 Grub-screw on set collar
- 12 Buffer ring
- 13 Striker-pin housing
- 14 Cap nut
- 15 Rubber ring
- 16 Acetone ampoule
- 17 Sleeve
- 18 Intermediate ring
- 19 Buffer ring
- 20 Celluloid disc reinforcing ring
- 21 Celluloid disc
- 22 Striker-pin
- 23 Striker-pin screw
- 24 Steel balls
- 25 Detonator
- 26 Safety groove: Red for 37, White for 53 without anti-withdrawal device

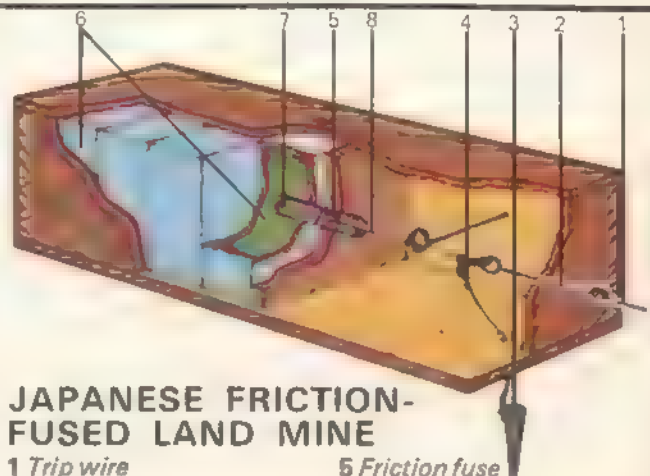
Peter Sarson Tony Bryan



GLASS MINE (ANTI-PERSONNEL) 43F

A German glass AP mine: 1 Pressure plate. 2 Shear plate. 3 Metal igniter plate. 4 Detonator. 5 Explosive. 6 Outer glass casing. 7 Chemical igniter. Pressure needed for detonation was 40lb.

Peter Sarson Tony Bryan



JAPANESE FRICTION-FUSED LAND MINE

- 1 Trip wire
- 2 Pull rod
- 3 Anti-lift stake
- 4 Anti-lift wire
- 5 Friction fuse
- 6 Main charge
- 7 Detonator
- 8 Pull wire

Peter Sarson Tony Bryan

1840 年

1840年，中国开始与英国进行鸦片战争，标志着中国近代史的开端。



Calais was another bloody defeat for the Allies—another victory for the *Panzers*. In the great drama of the fall of France in May and June 1940, the Allies suffered many defeats and the loss of Calais was soon forgotten as fresh disasters followed. Yet, as the battered survivors of the Calais garrison awaited the final, overwhelming German assault, they must have believed that their desperate resistance was still valuable.

The German armor first lunged for Calais on 22 May but could not take the town until late afternoon on the 26th—four days later. To gain those four days, General Sir Edmund Ironside, British Chief of the Imperial General Staff (CIGS), had sent in what he later called 'the most famous regiments in the British Army'. In accordance with the policy of the War Cabinet, they were abandoned to fight to the last against hopeless odds.

On 10 May 1940 the Germans attacked Holland and Belgium. The BEF, with the French First Army, advanced to help those countries. Meanwhile the Germans had concentrated all their armor—nine *Panzer* divisions—to the south opposite Sedan. These quickly broke through the weakened French line and gave the Allies a terrible lesson in *blitzkrieg*.

By 20 May, the *Panzers* reached the sea at Noyelles and the BEF, with its French and Belgian allies, was cut off. On the 21st the British tried to break out by mounting a tank attack at Arras ('War Monthly' issue 10). Although this failed, it did, for a time, cause panic amongst the SS Motorized Division *Totenkopf* and badly rattled the German high command. This British attack may have frightened the Germans enough to make them pause. But Ironside did not know this and he wrote in his diary that night: 'God help the BEF'.

Ruthless drive and personality

The leading *Panzer* Corps, the 19th, was commanded by Germany's most able and aggressive tank expert *Panzer* general Heinz Guderian. He had been the most vociferous advocate of the new tactics of rapid armored penetration in depth and he had the ruthless drive and personality to carry them through. His divisions had been fighting and moving since 10 May, yet when they reached the sea on the 20th he grudged even a day to recoup before fresh orders came. On 21 May orders did come; orders to drive for the Channel Ports and complete the utter destruction of the encircled allied troops. Exuberantly Guderian gave the command '19th Army Corps will turn North . . .' and issued the codewords *Abmarsch Nord*.

Guderian had been ordered to take Calais and Boulogne by 23 May but he could not keep to his schedule. His 2nd *Panzer* division was, at first, fiercely resisted at Boulogne and 1st *Panzer* encountered some surprising resistance on their way to Calais. The garrison of Calais had not yet arrived or taken up position although their advance guard, 3rd Royal Tank Regiment, were already probing out towards Boulogne. This probe by the British tanks met the forward assault group of 1st *Panzer* under *Oberst* Kruger. The Germans fought off the British tanks but their way was further barred by British 'non-combatants'. These were men of the 1st Searchlight Regiment who had few weapons and little training. But they put up a determined fight at Les

Attaques and Orphanage Farm until they were crushed by German tanks and medium artillery.

This courageous action by inexperienced soldiers caused a vital change in German plans. The War Diary of 1st *Panzer* describes the resistance as 'stiff' and adds 'Battle Group Kruger . . . when darkness fell stood at the gates of Calais. It was reported that the town was strongly held by the enemy and that a surprise attack was out of the question. The capture of Calais was handed over to the 10th *Panzer* Division . . .' So a chance to take the town by a *coup de main* was lost and the whole of one *Panzer* Division, with considerable support, was to be fully employed in its reduction.

Accustomed to war, Guderian and victory

As 1st *Panzer* broke off the action and pressed north to Gravelines the veteran 10th *Panzer* prepared to take Calais by assault. The men of 10th *Panzer* were accustomed to war, to Guderian and to victory. They had been part of Guderian's corps in the whirlwind Polish campaign and, as he said, 'The Polish campaign was the baptism of fire for my armored formations. I was convinced that . . . the work which had gone into building them up had been well spent.' They were then an elite and veteran division of Germany's elite *Panzer* forces—a formidable fighting unit. The commander of this division was an experienced and enthusiastic disciple of the new methods of warfare—Major-General Ferdinand Schaal. He was always to be found close to the action and to Guderian, who knew him well and claimed to have complete trust in his competence and reliability.

The garrison which awaited the assault of 10th *Panzer* contained troops with as much confidence and a uniquely long and proud tradition of soldiering. The backbone of the defense were 1st Battalion, Rifle Brigade and 2nd Battalion, 60th Rifles (King's Royal Rifle Corps). The 1,500 men in them knew that their forebears had held fast at Waterloo or stormed the breach at Delhi. 'These,' wrote Churchill, 'were the splendid trained troops of which we had so few.' These Regular Battalions were supported by the Territorials of Queen Victoria's Rifles who were to play a crucial role.

The infantrymen were backed up by the invaluable armor of the 3rd Royal Tank Regiment and eight guns of the 229th Anti-Tank Battery. Defense from aerial attack was the responsibility of the 6th Heavy and 172nd Light AA Batteries—with not enough equipment—and the valiant men of the Searchlight Batteries who had checked 1st *Panzer* division's advance.

Altogether 3,000 British and 800 Frenchmen fought to defend Calais. The French force was composed of men from all sorts of units and occupations—a company and a half of the 265th Infantry Regiment, four sections of the 202nd Machine-gun Company, a few armed customs officers, sailors, pioneers and firemen. Many of them were not part of the town's garrison but the famous 'Volunteers of Calais' who had come forward to help from the troops awaiting evacuation.

The Allies were heavily outnumbered. They were also at a massive disadvantage in terms of equipment and support. The Riflemen had been hurried to Calais in a desperate hour and their transport ships had been inefficiently loaded under the supervision of anonymous staff officers. In the general muddle vital transport and weapons were left behind and the troops needlessly 'mucked about'. Luckily, many men in the Rifle Regiments were experienced soldiers and quite hardened to the horrors of being moved by British Army

◀ Calais Harbour May 1940. A petrol dump on the outskirts of the town is set aflame by German bombardment. Allied troops fought against hopeless odds to defend the town.



Süddeutscher Verlag

German staff officers look on from an abandoned house as Guderian's Panzer forces devastate Calais street by street. Civilians fled the town as Allied armor was too weak to stave off the onslaught of the Wehrmacht

staff. But many of the soldiers who supported them were untrained and inadequately armed. The Allies had no artillery save for three or four 75mm guns manned by the French garrison. Ranged against them was not just the artillery of 10th *Panzer* but that of the 19th Corps to the extent of three heavy batteries. The *Luftwaffe* added to the strength of the artillery by sending in 100 Stuka dive bombers to deliver a tremendous pounding to the Allied positions.

German superiority in tanks was vitally important in the battles. In the last assault they roamed at will in the streets of Calais, firing pointblank into the houses and smashing through the hastily erected Allied road-blocks. The German tanks of 1940 were not invincibly superior to the British. Both were too lightly armored and too few of either had heavy guns. But the 3rd Battalion, Royal Tank Regiment, only had 48 tanks at Calais. Of these, 21 were Light Mark VIs, which mounted only MGs, and although most of the rest (medium A9 and A13) did have two guns capable of taking on German armor a few were A10 which only mounted a mortar and MGs. All these tanks were too thinly armored to withstand German tank and AT guns. Also, a number of British tanks were destroyed in action outside Calais and five valuable medium tanks were wrongly burned on 24 May to prepare for an expected evacuation. The Allies had fewer than 20 gun-armed tanks to defend Calais against the 200 armored fighting vehicles of a *Panzer* division.

The Germans had problems too. Many of their tanks had been damaged or had broken down since 10 May and a quarter of them were *Panzer* Is which were armed only with

MGs. Most of the German tanks had less than 15mm of armor and could be damaged by the British 2pdrs. But 10th *Panzer* had some *Panzer* IIIs which must have been formidable fighting machines with their 30mm of armor and 37mm guns.

They suffered, too, from air attack. The RAF were so persistent that Schaal referred to 'Allied air superiority'. There were also British destroyers in the Channel to support the garrison with gunfire. Despite all this the German strength was still overwhelming. When the French area commander, General Fagalde, ordered 'No evacuation' the die was cast.

Fagalde also confirmed a British Brigadier as commander of the garrison. This was Claude Nicholson a cool, professional cavalryman who gave an icy reply to German demands to surrender: 'The answer is "No," as it is the British Army's duty to fight as well as it is the German's.' Second-in-Command was the French Commandant Le Tellier. Both men were concerned to defend a town with a six to seven-mile perimeter with too few men.

Calais had been fortified by the great military engineer Sebastien Le Prestre de Vauban in the seventeenth century and his great walls were too thick for much of the German artillery. Nicholson made his headquarters in Vauban's formidable citadel in the west of the old town and decided to defend the outer ring of fortifications as long as he could. This would not be for long as, although Vauban's fortifications had been changed and added to in the nineteenth century, there were many gaps for roads and railway lines. Also, Nicholson did not have enough men for such an extensive line and realized that he would soon have to fall



The shattered streets of Calais after the battle seen from an He III. In response to the Allies' spirited defense and refusal to surrender the Germans all but destroyed the town. The Allied commander, Brig Nicholson, became a POW

back to Calais-Nord to defend the docks even though Vauban's defenses for Calais-Nord had long been demolished. He hoped, at the last, to hold the line of the Canal de Calais to the south. By the evening of 23 May his troops and most of their equipment had arrived. He ordered the 60th Rifles to hold the line of ramparts west and south and the Rifle Brigade the SE and east. Queen Victoria's Rifles (QVR) and others who were fighting a delaying action outside the perimeter would come under the command of whichever sector they fell back into. Behind these troops demoralized refugees and men of broken units hid or sheltered.

The men who had fought at Orphanage Farm and in other scattered actions were retreating into the town. Amongst them was Airey Neave, a troop commander in the 2nd Searchlight Battery. He had been in action that day and describes in his book *'The Flames of Calais'* his uncertainties as he reached Calais: 'I had now reached the Hotel de Ville after a weary march from Coulogne, half expecting the Germans from Orphanage Farm to pursue me. At 9p.m. . . . tanks were gathering in the shadows. The tracks rattled and jingled in the darkness—were they ours or theirs? The long whine of the shells from a German battery in the south promised a night of fear.'

During that night Brigadier Nicholson received a number of confusing orders. He learned at 0300 that the evacuation of Calais had been decided in principle. This was a relief and he began to arrange the carrying out of other orders—namely to escort 350,000 rations in lorries to Dunkirk.

During the same night Guderian became anxious. He had received reports of enemy troops landing at Calais. By dawn

10th Panzer were in position to attack on the west of the town.

It was obvious by now that the British could not break through to Dunkirk with the rations and that the Germans were mounting a serious attack on Calais from the west. Amidst a storm of mortar and shell-fire, German infantry pushed forward against the sector held by the 60th Rifles and QVR. At 1200 the Commander of the German 69th Rifle Regiment reported: 'Despite MG nests and barricades the regiment has reached the inner town at three points.' He was wrong. His regiment had only forced the Allies off the outer ramparts at considerable cost both in men and tanks. Besides this, Fort Nieulay, a position outside Calais was still being held by its French garrison and troops of QVR.

The Allied line began to show signs of breaking during the afternoon and the 60th was reinforced by men from other units. Officers toured the harbor where soldiers were awaiting evacuation and appealed for volunteers. The French Naval commander, *Capitaine de Frégate* Carlos de Lambertye, told those who stepped forward, 'We must be ready, gentlemen, unless something quite unexpected happens, to fight to the death.' Among these volunteers who marched away from safety was Airey Neave. He went forward, with about fifty other ranks, to reinforce the 60th and was greeted by Major J. S. Poole with alarming news 'I am afraid they may break through,' he said. 'Get your people in the houses . . . and fire from the windows. You must fight like bloody hell.'

The German pressure increased and it was obvious that the Allies would soon have to withdraw to Calais-Nord. Not only the weight of the bombardment told against the



◁ 26 May 1940. Calais is in the hands of the Germans. The Allies put up a fierce and desperate resistance. They fought on on Churchill's orders. Guderian's 10th Panzer Division wreaked havoc and destruction on this pretty French coastal town. But there was one gain for the Allies: German efforts in Calais prevented them cutting off the BEF retreat from Dunkirk. Here, German motorbike patrols ride along Calais' battered streets

▷ Map shows the hopeless situation Allied forces were in in their defense of Calais. Even so, it took the 10th Panzer Division three days longer than planned to take it.

defenders but also the strong presence of the Fifth Column. They must have entered the town with the hordes of refugees and then, as Lieutenant-Colonel Chandos Hoskyns, CO of The Rifle Brigade battalion, wrote before he died, 'They sprang up behind us in uniform with submachine-guns, grenades and ammunition'. Some wore French uniform and spread false rumors, others sniped at the Allied soldiers from the old town in their rear. One such agent fired with a tommy gun on the 60th throughout the battle from the roof of Notre Dame. The Allies lacked the manpower to hunt such people down.

As darkness closed around them the men in the sector of the 60th Rifles fell back in the south to positions behind the canal. They blocked the three bridges, the Ponts Freycinet, Georges V and Faidherbe and occupied the houses along the Quai.

On the Rifle Brigade front the Germans had not yet applied such pressure. They shelled the positions of the overstretched Allies but did not attack in force. The Riflemen showed a light-hearted 'holiday spirit'. They engaged the German 69th Rifle Regiment with zest. But their enthusiasm was not shared by those who knew what was to come. At the end of this day Major Alexander W. Allan wrote: 'The 24th had been a day of great tension. Not a great deal of fighting had been done by the Rifle Brigade nor were many casualties incurred, but the noise of bombs, artillery, automatic weapons and sniping: the fantastic stories put about by enemy agents: . . . and above all the fact that no commander ever had a moment to look around him and think and plan for more than the immediate future, all tended to intense fatigue.'

The Germans also had their problems. Guderian records: 'I visited the (10th Panzer) division during the afternoon and ordered it to advance carefully so as to avoid casualties. On the 25th May it was to be reinforced by the heavy artillery that was no longer needed at Boulogne'. Even this cautious approach was eclipsed when momentous and inexplicable orders arrived from Hitler instructing the Panzer thrust to halt on the Aa canal and specified that: 'Dunkirk is

to be left to the *Luftwaffe*. Should the capture of Calais prove difficult, this port too is to be left to the *Luftwaffe*.' These orders were one of the serious misjudgments which allowed the BEF to escape at Dunkirk. Guderian was horrified and resolved to press his assault on Calais.

Major-General Schaal never doubted that he would take Calais on 25 May and sent the bulk of his tanks to the east of the town to cut off the retreat of the garrison. His infantry made ready to attack during the night and he ordered his artillery to concentrate on the citadel and the docks. Because of this methodical preparation the Germans did not move forward into the town until after breakfast on 25 May. This gave the Allies a breathing space

During the night the Allies strengthened their positions as best they could. There were few places where trenches were feasible and they had no sand-bags or entrenching tools. There were no charges powerful enough to destroy the three bridges which the 60th were holding. Instead, they were blocked with abandoned vehicles. Houses overlooking these barricades were made into firing positions, but as Lieutenant-Colonel Euan A. B. Miller, CO of the 60th, wrote of these houses: 'The chief difficulty was that most of them could only be entered from the front in full view of the enemy. Work was at once begun on breaking into them from the back and through the side walls for communication. Adequate tools, however, were lacking and though the work went on for twenty-four to thirty-six hours, it was never completed.'

Nicholson was in good spirits as he received a telegram at 2323 saying that help was on the way from the BEF. Unfortunately this was totally untrue. Nevertheless, when Vice-Admiral Sir James Somerville came into the harbor that night he met Nicholson and later reported at Dover, 'Nicholson is tired but in no way windy. His two chief anxieties are mortar ammunition and the need for artillery.' This was reported to the War Office but Nicholson was never to receive either artillery or ammunition

Both Germans and British had high hopes and both were ready for battle. By the morning of 25 May both were



deploying all their forces. The stubborn struggle was about to begin. Just before dawn on that day Guderian issued his orders: 'Calais will be captured on 25th May.'

But Schaal was in no hurry. His troops advanced into those parts of Calais which the garrison had abandoned. At 0800 they raised the swastika over the Hotel de Ville. To many of them it must have seemed that the town would be taken easily. But soon they reached the Allies' prepared positions and sent Schaal the message: 'The quadrangle south-east of Fort Risban, the Citadel and Fort Risban itself are still occupied and are being defended with toughness.' The regiment which discovered this was the German 69th Rifle Regiment and they sent the captured Mayor to demand Nicholson's surrender. His reaction was characteristically blunt. 'If the Germans want Calais they will have to fight for it,' he told the Mayor.

Schaal decided to add a little persuasion to the Mayor's

message with an artillery bombardment and dive-bomber attack and ordered, 'The citadel is to be completely destroyed.' But he had underestimated the strength of Vauban's works. These stood up well to the attack whilst the men in the citadel—mainly French with a detachment of Royal Marines—were partially sheltered by the masonry.

Elsewhere, however, the shells inflicted casualties and the German infantry began to infiltrate the Rifle Brigade sector from the south. The Rifle Brigade, with units of the QVR, fought back ferociously in hand-to-hand struggles but they were overstretched and some platoons were overrun or cut off. In this sector the Allied position became grave and at 1530 Lt.-Col. Hoskyns was mortally wounded while trying to organize a counter-attack. But the spirit of the Rifle Brigade had no been broken by either the confusion or the shelling. Although they could still defend the harbor from strong-points behind the lake of the Bassin des

Panzerkampfwagen 1 Aus 'B'



At this stage of the war, 10th Panzer Division would have had about 50 of these tanks. Weight 5.7 tons. Crew 2. Maximum road speed 25mph. Armament 2 7.92mm MGs. Engine 100bhp Maybach NL38. Armor varying from 6-15mm. Also used as an ACV, this tank was taken out of service in 1941.

British Mk. VI B



This is one of only 20 gun-armed tanks the Allies had at Calais. Weight 5.5 tons. Crew 3. Maximum road speed 35mph. Armament 1 .5in Vickers MG (main), 1 .303in Vickers MG (secondary). Engine 89bhp Meadows. Armor varying from 4-14mm. This vehicle was developed from the Carden-Lloyd tankette



In their retreat from the advancing 10th Panzer Division, the remnants of the Allied garrison were forced to abandon much precious transport and equipment. A lot was destroyed in the fight but some was salvaged by the Germans.

Bundesarchiv

Chasses de l'Est and on the Quai de la Loire, the British had been badly mauled.

Schaal's attack was not going so smoothly in the sector of the 60th Rifles. The three canal bridges were held and the shelling of the Citadel had not cowed the defenders. A second demand for Nicholson's surrender had been sent by Lieutenant Hoffmann of the 2nd Battalion, 69th Rifle Regiment. This was turned down flat at 1500. Impatiently Schaal brought up his tanks and announced a 'major attack'. The infantry were told to take the Citadel and 'annihilate the enemy inside'.

At 1900 the attack began as tanks rolled forward at each of the three bridges. At the Pont Faidherbe three of them smashed through the British roadblock but two were stopped and the third turned back. The leading tank at the Pont George V blew up on a mine and the attack was held. But at the Pont Freycinet one tank and some infantry broke through. Counter-attacks drove the tank back but some German infantry remained across the bridge.

In the late afternoon the remains of the 3rd Royal Tank Regiment tried to break out of the beleaguered town with the wounded but were almost all either destroyed or captured. Before this their patrols had been invaluable but now the defenders faced the Germans without tank support. Besides this, much of the Old Town had been set ablaze by shells and the flames drove the Allies from their positions. Yet, as night closed in, it was the Germans who felt they had the problems.

There was a note of surprise in German complaints that the town was 'more heavily defended than anticipated'. The situation was exceptional and the staff and diary of 10th Panzer recorded 'The attack on the Old Town has been held back. The enemy fights in a most tough and ferocious manner', and 'The enemy fights with a hitherto unheard-of obstinacy. They are English, extremely brave and tenacious.' At 2145 Schaal had had enough, and reported, 'Today's attack has shown that the enemy will fight to the last man and holds strong and unshaken positions. The attack . . . is at a standstill.' At 2300 Schaal met his commanders and they confirmed that Allied resistance was 'very violent' and asked to postpone the attack. But Schaal insisted, 'It is of

the utmost importance not to give them time for rest or to reinforce their troops from the sea. The last defended positions must be taken tomorrow.' This would mean another full-scale assault for which he had to ask Guderian for more heavy artillery and dive-bombers.

As Schaal planned the attack, the Allies took stock of their situation. From a blockhouse overlooking Calais, Second Lieutenant Jabez-Smith of QVR described the scene: 'Calais was on fire. Red, orange and yellow flames burned skywards from various points in the town. From our platform it seemed that the whole city was burning. Between us and the city was a lake called the Bassin des Chasses and in this the flames were reflected. The scene made me think I was witnessing the sacking of some medieval walled city.' By now Churchill, Eden and Ironside had decided, in London, that the garrison must be left to fight to the last and not be evacuated. Nicholson spread this grim news and ordered Eden's message to be circulated. It read: 'The eyes of the Empire are upon the defence of Calais and HM Government are confident you and your gallant regiments will perform an exploit worthy of the British name.'

The garrison faced death, wounds or capture. During the night they prepared themselves for the hopeless fighting of the next day. In the Channel behind them destroyers opened up on the German positions. This caused wild cheering and renewed hope. A hospital ship was able to take off many of the wounded before the dawn stand-to.

At 0500 the first rounds of Guderian's full Corps artillery crashed into the garrison and accurate mortaring preceded another attack. The barrage became increasingly fierce and wave after wave of Stukas bombed and machine-gunned the Allied positions. In the Rifle Brigade sector German infantry worked their way round the north of the Bassin des Chasses and moved forward everywhere behind accurate mortar fire. Major Allan had already ordered the Rifle Brigade: 'All troops stay in these positions to the last. There will be no further withdrawals.' By 1100 the Germans were ready to attack the Gare Maritime.

In the area of the 60th Rifles the struggle was still concentrated on the road-blocks on the three vital bridges. The Pont Faidherbe was held by only two men, Captain



The savage battle at an end, a few straggling British survivors march into captivity. Guderian himself was to praise the courage and tenacity of such men. Five weary years were to pass before they would see their homes again.

Duncanson and Lance-Corporal Pickett and they were wounded. Still, they repelled a tank and infantry, inflicting heavy losses, at 1000. By 1100, however, the Germans had crossed the bridges. Although wounded many times, the commander of D Company, Major Lord Cromwell, was still fighting. By 1130 only he and two riflemen were left alive at his barricade and they had no choice but to fall back. Many acts of courage and desperation were performed but the position deteriorated.

The Germans were continually surprised and disconcerted by the fierce resistance. The 10th *Panzer* Division War Diary records: 'Enemy gives impression of being fresh, seems to have received reinforcements.' This was not true. The finish was not long in coming.

The 60th Rifles were forced back into the streets of Calais-Nord. This regrouping was covering by the truly heroic defense of Bastion 11 by 80 Riflemen and various French soldiers and volunteers. Although their ammunition was exhausted by 1300, both French and British refused to surrender. After the German assault only 17 Frenchmen were left alive and only 30 Riflemen survived unscathed. The cellars of the town were full of demoralized French soldiers who would not fight, but the hardiness and gallantry of the 'Volunteers of Calais' at Bastion 11 and the Citadel more than upheld the 'Honour of France'.

In the Rifle Brigade's sector the Germans overran the stubborn QVR platoons in the cellulose factory which dominated the Quai de la Loire. There was hand-to-hand fighting around the Gare Maritime but the QVR and Rifle Brigade were forced back to a last stand in the sand dunes on the sea shore. There, at 1530, or shortly afterwards, the British were overcome in a bitter skirmish. Within sight of the cliffs of Dover, the survivors were marched away to five years of weary captivity.

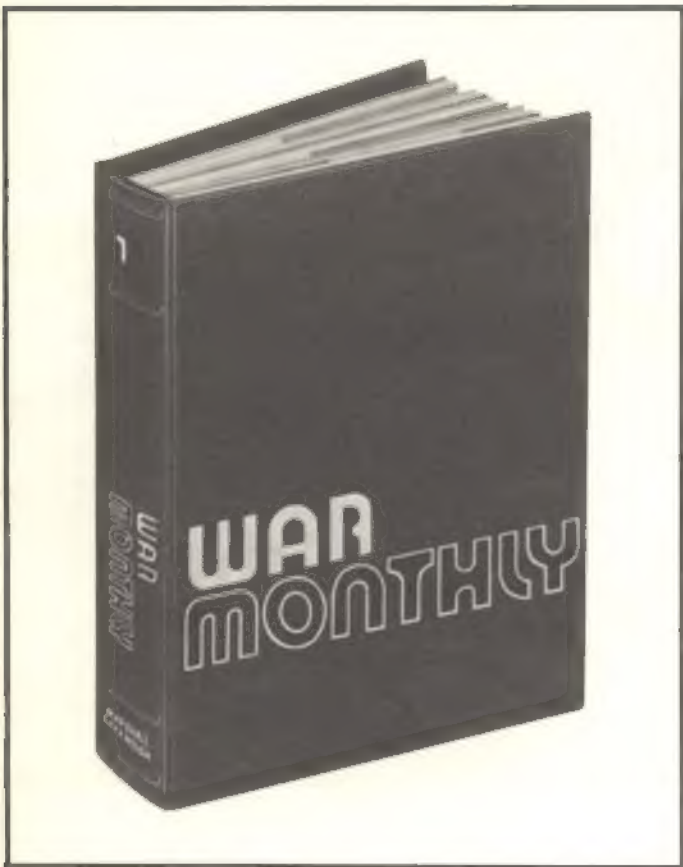
At about this time German tanks surrounded the Citadel

and infantry surged through the South Gate. Nicholson was captured and later died a POW in 1943. The 60th Rifles fought on in the streets of the Old Town but, by 1600, they were split up into small groups. By 1700, most of them and the remaining QVR were forced to surrender. Effective resistance was ended.

Was this desperate resistance wasted? Churchill and most British commentators wanted to believe that Calais was the action that halted the *Panzers* long enough for the BEF to secure its retreat to Dunkirk. Guderian makes too little of the matter and claims that it was Hitler's disastrous order to halt that saved the BEF. Yet, if Calais had not been garrisoned, it would have fallen early on 23rd and 1st *Panzer* might well have reached Dunkirk on the 24th before Hitler's orders could stop it. Even if this were not so there is evidence that a great deal of Guderian's Corps was involved until late on the 26th in the reduction of Calais. If it had not been would not a man of Guderian's vigor and gift for insubordination have shrugged off the fatal orders to halt? It seems fair to say that the British did not save themselves by their own efforts but were saved by Hitler's mistake. Yet, if the Allies had not mounted such resistance as they did—not only at Calais but at Boulogne and their counter-attack at Arras—not even Hitler's order could have saved them.

Peter Banyard

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